# approach

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FEBRUARY 1984 THE NAVAL AVIATION SAFETY REVIEW

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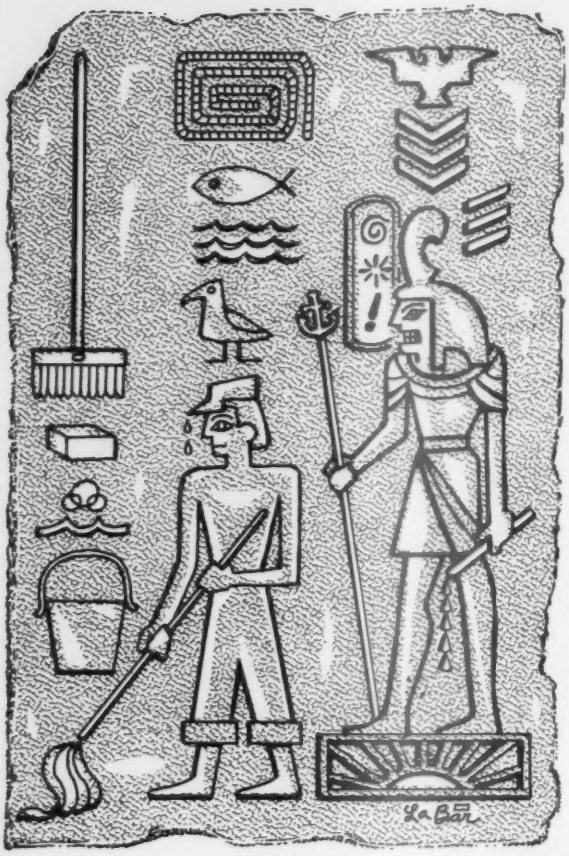


*An Anymouse form was submitted recently, which described an illegal and dangerous action by a pilot airborne. It was one of those judgment errors that many pilots have made and several have died from. In this case, some skillful airmanship and a lot of luck prevented a disaster. The incident was not officially recorded except for the Anymouse. The pilot happened to be the commanding officer. A postscript on the Anymouse read:*

*"If you print this, please wait until (a later month). I transfer (then) and the CO will recognize this and bury me if you print it before then."*

*My first reaction was to dismiss this as a crank remark. But after careful reflection, I remembered times when I would have felt just as nervous about submitting an anonymous report. Then, with uncanny timing, another Anymouse arrived, saying that a squadron CO was requiring Anymouse forms to be chopped through him before being sent to the Safety Center!*

*Let it be known that you can always submit an Anymouse. You don't need to chop it through anyone, put your name on it, or even have the proper form. You can mention names, dates, squadrons and any other details you feel are necessary. We will pass the information along to those in positions to do something about the problem, where applicable. If we decide to print your Anymouse, we will then "sanitize" it to protect the identities of all concerned. If you want us to delay printing it, we can honor that.*

*Communication is vital to safety. Personnel must have a means of passing along safety information without getting "put on report" for it. Anymouse is a means to do that for everyone from E-1 on up. Sure, we get "crank" and "poison pen" submissions from time to time that contain no safety information. We put those where they belong — in the wastebasket. But action gets taken on every legitimate safety problem submitted.*

*Lt. John Flynn*
*Editor*

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# inside approach

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Vol. 29 No. 8

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**A Look Back** 2
*By R.A. "Chick" Eldridge. Forty years of reminiscing about naval aviation and aviation safety.*

**"But There Was No Refusal Speed!"** 10
*By Lt. Dick Holloway. P-3 aborts are not always a "piece of cake."*

**Some Physics of Turning** 12
*By Capt. Milt Miller and Col. Grant B. McNaughton. Banking an aircraft at low level can be critical.*

**Good Enough is Not Enough** 15
*By Lt. Randy Mahoney. Thorough knowledge of your aircraft is a must.*

**It's Really Happening to Me!** 16
*By Cdr J.E. Mann. With all the risks you take, why buy it in a car?*

**NATOPS and the Duke** 18
*By Lcdr. Marty Fox. Know NATOPS before an emergency.*

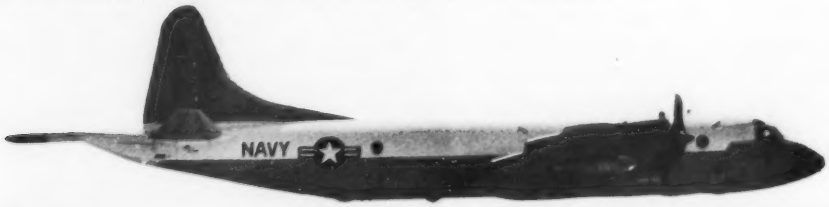
**Fatigue** 20
*By Lcdr. Janet Markle, MC. Understanding fatigue is not easy. It can do you in.*

**Night Shots in a No Parking Zone** 22
*By Lt. Paul R. Senness. A mishap leads to changes in CV spotting procedures.*

**The HAC Didn't Hack It** 28
*By Russ Forbush. Flying an aircraft with a malfunctioning fuel system is courting disaster.*

**The Skipper's On Board** 31
*By AXCS Gordon Flinn. Safety is never secondary, even with the skipper on board.*

**Don't Ask** 32
*By Lt. R.C. Thompson. When it comes to a bingo, you're in charge.*




**DEPARTMENTS**

Air Breaks 8
FOD-gram 25
Bravo Zulu 26

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# A Look Back

## Forty years of reminiscing

**By Richard A. "Chick" Eldridge**
**Approach Writer**

THIS article is different from those I have written during the past 21 years. It is a swan song, a way of saying sayonara to my long association with naval aviation.

My first thoughts about naval aviation were generated by an advertisement in men's magazines of the early '40s showing a newly designated Ensign leaning on the prop of an F4U Corsair. The poster to the right was another effective inducement. Both enticed a lot of aspiring aviators, myself included, to try for those coveted wings of gold.



I was accepted by the Navy in August 1942 for flight training. My original designation of seaman second class was shortly changed to aviation cadet. Although originally ordered to report to preflight school at Chapel Hill, North Carolina in November 1942, I was allowed to finish college and report to Athens, Georgia in April 1943.

In those years the preflight schools were structured into three main areas of concentration — academics, athletics and military aptitude. Like several thousand other cadets, I will carry some memories of those days with me to the grave. Those who spent hundreds of hours marching in the red clay of Georgia under a broiling sun will never forget those hard-bitten Marine drill sergeants fresh back from Guadalcanal. Talk about marching to the tune of a different drummer!

I remember the infamous "pack test" which all cadets had to take upon entering and leaving preflight school. The test must have been the brainchild of some sadist to test the staying power of prospective aviators, when their every instinct was to quit and sit down. It involved toting a pack of sand on your back, the weight of which was based on your weight. You then had to step up and down about two feet, with an iron bar to hold onto for balance. This was kept up for five minutes to a rhythmic beat of about 15 per minute. The purpose of the test was to measure the time it took the heart to return to normal after the five minutes of exertion. I sure hope the medics learned something from this torture.

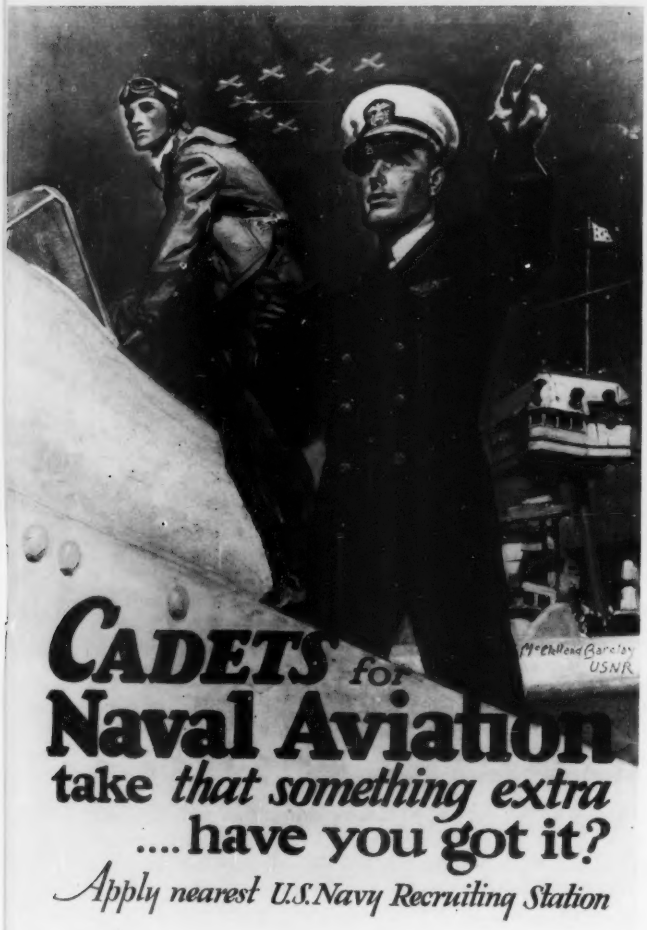
The athletic instructors at preflight school were naval officers recruited from the ranks of professional and college athletes whose names were well known to sports buffs. There was Dale Burnett, a back from the New York Giants and Billy Patterson, an All American halfback from Southern Methodist. Our hand-to-hand combat instructor was Ed Don George, the former heavyweight wrestling champion of the world. There was no lost motion in the curriculum. It was three months of rugged sports participation, with battalion competition on the weekends, a no-nonsense course of academic instruction, mostly in naval subjects, and the never-ending drudgery of military drill. If the aviation cadet failed to finish preflight a better individual physically, mentally and academically than when he entered, it wasn't the Navy's fault. In retrospect, I feel that preflight was the best organized and well run school I attended in the Navy.

Following preflight, I was introduced to my first taste of hands-on flight training in the venerable N2S — a very forgiving biplane trainer (nicknamed the Yellow Peril). For the most part, primary flight training was a thoroughly enjoyable, most interesting three-month stint of new experiences. One humorous incident of my primary days occurred to a cadet the day after we had received our lecture on the use of the parachute.

When the student reported to the flight line for his first flight in a naval aircraft, he was incorrectly listed on the scheduling board as a C stage (acrobatics) student. No words were spoken as the instructor and student manned the N2S. After takeoff, they climbed to the acrobatic area where the instuctor promptly demonstrated a beautiful slow roll. After the slow roll, the instructor attempted to talk to the student via the gosport but got no response. When he turned around and looked into the rear cockpit — the student was gone! The cadet had forgotten one important thing on his first flight — to fasten his safety belt. However, he didn't forget his parachute lecture and was one of a small minority who joined the Caterpillar Club on his first flight.

To my recollection, there was little emphasis on aviation

The author in a TBM torpedo bomber — a rugged aircraft.




It was the gold wings that got me!

safety. What safety information was imparted to the fledgling aviator came from the primary instructors. Lessons learned usually came in the form of "gems of instructor wisdom." You were simply told to fly certain maneuvers in a specific way or wind up as a statistic. In those days, there was no such thing as NATOPS. What pleased your own instructor might not please a check pilot, who had his own idea how a "slip to a circle" or a "slip to a small field" landing should be flown.

We were all aware, however, that a stupid mistake, or a forgotten procedural step, could cause one to suddenly quit eating potatoes and occasionally it happened. One aspect relating to aviation safety which was drummed into us was keeping our head on a constant swivel to avoid the ever present threat of a midair collision. I've always wondered why more collisions didn't occur, since the number of aircraft returning to the field at the end of a hop was like a swarm of bees buzzing around a honeycomb.

Despite these slight idiosyncrasies, the primary flight instruction was excellent, and the instructors were a very dedicated cadre of professionals. But I believe that after a year's experience in instructing, the majority of them would have sold their soul to get into a combat squadron.

Following primary, I went to Corpus Christi for basic training in the SNV (Vultee Vibrator), a fixed landing gear, 450 HP low-wing monoplane, and instruments and advanced training in the SNJ. At Corpus we were introduced to formation flying, instruments, inverted spins, navigation, gunnery, bombing and night flying to mention most of the phases. In keeping with the rest of the naval air flight training program, the basic, instrument and advanced training squadrons were well organized, provided excellent instruction and thoroughly prepared the soon-to-be naval aviator for his next training — an operational training squadron where he would fly the aircraft that he would fly in a fleet squadron.

Graduation, the awarding of those coveted gold wings, was the culmination of a year's blood, sweat and frustrations. It was the carrot at the end of the stick that kept the adrenaline flowing. My wings were pinned on in April 1944 by Admiral C.P. ("How We Lost a Gallant Lady") Mason, who was the CO of the original carrier Hornet, before it was sunk by the Japanese.

After Corpus Christi, it was operational training at Ft. Lauderdale and an introduction to the TBM (Grumman Avenger) torpedo bomber. I will never forget the feeling of awe that I had just before mounting the wing for my first flight in the *Avenger*. Going from an SNJ to the TBM, I suppose could be likened to stepping into a Mack truck after driving nothing but a Volkswagon.

At operational training we met and flew with the crew that would go with us to the fleet. The TBM had a crew of three, and my gunner and radioman stayed with me for the next

two and a half years.

In operational we were introduced to FCLP, probably the most important aspect of flight to the carrier pilot — learning how to land aboard a carrier. We were soon to experience our first taste of carrier aviation, of all places on Lake Michigan.

In 1944 the Navy was using two old paddle wheel coal-burning steamers [USS *Sable* (IX-81) and USS *Wolverine* (IX-64)] which had been converted into aircraft carriers of a sort. The *Sable* and *Wolverine* were a far cry from combat carriers but were suitable for accomplishing the Navy's purpose — that of qualifying naval aviators fresh out of operational flight training in carrier landings. The two carriers had certain limitations such as having no elevators or a hangar deck. When barrier crashes or other flight deck crashes used up the alloted spots on the flight deck for parking dud aircraft, the day's operations were over and the carriers headed back to their pier in Chicago.

Another problem they had to contend with was wind over the deck (WOD). Certain WOD minimums were required to land aircraft such as F6Fs, F4Us, TBMs and SBDs. When there was little or no actual wind on Lake Michigan, operations often had to be curtailed because the carriers couldn't generate sufficient speed to meet the WOD minimums. It is doubtful if the two carriers were capable of making more than 20 knots under their own power.

Occasionally, when low wind conditions persisted for several days and the pool of waiting aviators started to bunch up, an alternate system of qualifications was used. The alternate system was to qualify the pilots in SNJs — even though most pilots had not flown the SNJ for four or five months. Can you imagine what kind of an impact that would have on aviation safety today?

My own operational flight was a good case in point. We were sent to NAS Glenview to qualify in the TBM. After several flights of refresher FCLP, we were exposed to our first arrested landing. Unbelievable as it sounds, a one-wire arresting gear had been constructed in what for all practical purposes looked as if it had been a cow pasture. It was not an airfield, but a small landing strip that had been hacked out adjacent to the arresting gear where the LSO was positioned. That was where I made my first arrested landing in a TBM.

Unfortunately for those of us who were awaiting carrier qualification at that time (July '44), it was a period when there was very little true wind on Lake Michigan. Therefore, the powers that be decided that they would get rid of the large pool of aviators by qualifying them in the SNJ rather than the service type aircraft flown in operational training.

On the face of it, that decision seemed to be an expedient way to solve the problem. From the viewpoint of aviation safety, it could have been a disaster. About 40 pilots were assembled for a briefing on how to fly the SNJ in the carrier landing pattern. The briefing was given by an LSO and

The SNJ was the Cadillac of prop trainers. Thousands of WW II pilots flew this aircraft.

included such things as flying the pattern, speeds, altitudes and procedures on the flight deck after landing. One incidental point mentioned was that some of the SNJs had airspeed indicators calibrated in knots while others were calibrated in miles per hour. We were advised to be certain which type airspeed indicator we had.

In today's aviation safety conscious environment, what we were about to do would cause Grampaw Pettibone to have a heart attack! Our briefing LSO told us that we would get one warmup flight in an SNJ and then load aboard the

The USS *Sable* during flight operations on Lake Michigan.

USS *Sable* the next day, for a three-day excursion on Lake Michigan. As mentioned earlier, it had been about five months since most of us had flown an SNJ, *and not one of us had ever flown it during FCLP.*

Surprisingly, the qualifications went rather well, considering that no one had ever flown an FCLP pass in the J-bird, much less a carrier approach. Flights of SNJs took off from NAS Glenview and came out to the carrier. As these pilots finished their carquals, the 40 or more captive pilots



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onboard were hot-seated and in three days finished their qualifications.

After the short interlude at Glenview, my operational flight was sent to COMFAIRWESTCOAST where we were split up and assigned to various VC squadrons. In those days the VC squadrons consisted of 20 fighters (FM-2s) and 20 TBM torpedo bombers. We managed to get our taste of combat at Iwo Jima and Okinawa. For the most part, our TBM missions consisted of flying close air support for the ground troops, dropping bombs and shooting lots of rockets.

It's funny how memories stick with you. I can still remember thinking to myself as we were flying on our first combat mission, "Am I really qualified for this hop?"

Another memory has to do with the intricacies involved in operating with a multicarrier task group. While operating in the Okinawa area, it was not uncommon to find ourselves conducting carrier operations with as many as 12 jeep carriers, all launching and landing aircraft simultaneously. It is a very impressive sight to see 12 carriers swing into the wind on signal and start catapulting aircraft. It was also mighty important to know what your 30-degree landing pattern was and what bearing your own carrier was from the guide, lest one land on the wrong carrier.

Probably the most vivid scenes etched in my memory were

LSO cuts an aircraft aboard USS *Sable*.

the occasions when our jeep carrier task force joined forces with Task Force 58. The night before the rendezvous our task force might consist of 20 to 25 ships. When we arrived on deck the next morning, there was nothing but ships as far as the eye could see. For 20 or 25 miles one could see nothing but carriers, battleships, cruisers, destroyers and auxiliaries. It was indeed an awe-inspiring sight and left no doubt in our mind as to the awesome destructive power assembled at one time. I'm sure there were 100 or more ships rendezvoused on these occasions.

In the post WW II Navy, I completed two more torpedo

An Avenger torpedo bomber on its way to the target.

squadron tours, a year at General Line School and a tour in the Training Command's Carrier Qualification Training Unit where I was trained to be an LSO. Following the Training Command, I arrived at AIRLANT and was promptly assigned to an Air Anti-Submarine Squadron as LSO. I was still flying TBMs, the ASW version, and was back to flying on and off jeep carriers. During the years I spent in torpedo squadrons (1945-1948), my squadrons operated from Essex Class carriers. When a carrier aviator learned his trade flying off Kaiser Class jeep carriers, the transition to an Essex Class CV was as the saying goes, "like shooting fish in a rain barrel." It was quite a comedown to go back to a jeep carrier CVS.

In January 1953 I reported to the Naval Aviation Safety Activity and from that day on I became safety oriented. The Safety Activity had been moved from one obscure room in the Pentagon to NAS Norfolk during December 1951. When I reported aboard, there were a total of 27 personnel, about equally divided amongst officers, enlisted and civilians. At about this time the powers that be in Washington determined that there was definite need for an all-out improvement in naval aviation safety. Take a look at some statistics that apply to Fiscal Years '50, '51 and '52.

| FY | Major Accidents | Rate | Destroyed Aircraft | Fatal Accidents | Fatalities |
|---|---|---|---|---|---|
| 1950 | 1,488 | 53.7 | 481 | 137 | 227 |
| 1951 | 1,714 | 54.0 | 675 | 185 | 391 |
| 1952 | 2,066 | 54.8 | 708 | 224 | 399 |
| CY | | | | | |
| 1982 | 90 | 4.42 | 83 | 40 | 74 |

If you look at these statistics and compare them with those for calendar year 1982 (we changed from fiscal to

Units of Task Force 58 at anchor at Ulithi.

USS *Makassar Strait* (CVE 91) — the author's WW II carrier.

calendar year statistics beginning in 1975) you can note a tremendous improvement in 32 years. Since 1950 the Navy's mishap rate has been lowered from 53.7 to 4.42 — a whopping reduction.

I did two tours of duty at the Safety Center, 1953 to mid-1956 and from June 1960 until I retired in 1964. During most of those years I wrote the Weekly Summary and for Approach Magazine. In March of 1970 I returned to the Naval Safety Center as a civil servant, and for the past 14 years have written aviation safety material for both Weekly Summary and Approach. You might say that I found a home away from home at the Naval Safety Center, since I spent nearly 22 years within its confines. I am retiring once again from the Safety Center on 3 February 1984.



In looking back over the 20 plus years at the Safety Center that I have been reading and writing about incidents, accidents, mishaps and other hazardous occurrences, it is obvious that there are rarely any new types of mishaps. Errors of omission and commission which caused accidents 40 years ago still do so today. We still lose aircraft from midair collisions, running out of fuel, hitting the ramp, inadvertently landing wheels-up and stalling from insufficient airspeed to give a few examples. Looking on the positive side, however, is the fact that these type of losses are far less in number today. I believe this can be attributed to the tremendous importance that has been given to aviation safety at all echelons of command. Today's naval aviators are instilled from the beginning of flight training with the philosophy that aviation safety is a personal matter. That this philosophy has paid dividends can easily be understood by comparing the statistics cited previously for the early '50s and those for 1982.

Although it would be difficult to relate a specific instance of mishap prevention to an article written in Approach or any other safety publication, nevertheless, that is the ultimate goal of all who write about aviation safety. The idea is to make aircrews aware of what has happened or can happen under certain circumstances and then to react in a positive, safe manner considering all alternatives. Hopefully, I may have been successful in this endeavor.

During my 40 years of association with naval aviation I have noted a number of innovations, improvements in existing equipment, the manufacture of new equipment and the use of new operational concepts, all of which have had a tremendous impact on aviation safety.

**Angled Deck.** When the Navy started to convert existing aircraft carrier flight decks and to construct new angled deck carriers, the greatest single benefit for aviation safety was acquired. The Navy's first carrier landing on an angled deck was made January 12, 1953 when the CO of the USS *Antietam,* Capt. S.G. Mitchell, landed aboard in an SNJ. The main advantage of the angled deck was that aircraft which did not catch a crossdeck pendant for whatever reason, no longer wound up as a barrier crash accident. As the saying goes, it took most of the "sweat" out of a carrier landing. Except for a very rare and unique set of circumstances, the angled deck eliminated the catastrophic type of accident when an aircraft bounced over the barriers and into the pack of aircraft parked forward of the barriers on axial decks.

It also helped the mental attitude of a pilot making his first carqual landings to know that his initial efforts did not have to be letter perfect. A bolter resulted in just a poor landing grade rather than a barrier crash.

**The Mirror and Fresnel Lens.** On August 22, 1955 Cdr. R.G. Dose, CO of VX-3, made the first carrier landing using the mirror landing system, when he landed aboard the USS *Bennington* in an FJ-3. The mirror landing system, or OLS (optical landing system) as it later became known, was one giant step forward for aviation safety. If the angled deck took most of the "sweat" out of a carrier landing, the mirror and Fresnel Lens systems took the anxiety out of a carrier approach. Not only did the system allow the pilot to visually note his relative position to the desired altitude, it raised the carrier landing pattern several hundred feet. This aspect alone, in conjunction with a Marshal point aft of the carrier, eliminated the necessity of a formation to break at 300 feet ahead of the carrier and turn to the downwind leg of the old carrier approach. Such a break, particularly when there was

no horizon at night, contributed to the deaths of a great many naval aviators when they became disoriented and flew into the water.

**Field Arresting Gear.** The advent of jet aircraft brought with them the need for a runway system to arrest jets with landing and takeoff emergencies when normal deceleration wasn't possible. Initial trials with such a system began in 1948 at NAS Patuxent River. The original anchor chain type arresting gear has gradually evolved into several very sophisticated arresting gear installations at Naval and Marine Corps air stations and facilities. It would be impossible to state how many arrestments over the years have prevented accidents, but when you consider that the yearly total of field arrestments in 1982 amounted to 4,822, the savings in aircraft, dollars and lives is tremendous.

**NATOPS.** Another great stride was made in aviation safety when we gave birth to NATOPS in 1961. The essence of the NATOPS program is one word — *standardization.* It certainly makes sense to have all pilots flying the same aircraft in the same manner, following standardized procedures, including emergency procedures. In the more than 20 years that NATOPS has been in existence, it has proven to be an excellent tool to keep pilots and crewmen vitally aware of aviation safety as it applies specifically to their aircraft. It's refreshing to know that a pilot can change from one squadron to another, knowing that as long as he is current in his knowledge of NATOPS, he will make an easy transition.

**Ejection Seats.** The ejection seat has undoubtedly been the greatest single life-saving device since the parachute. In August of 1948 Lt. J.L. Fruin was the first naval aviator to eject successfully, when he ejected from an F2H-1 Phantom at 597 KIAS. Since that time there have been more than 3,650 successful ejections from naval aircraft. In those 35 years, ejection seats have been modified and improved to the point that under the right set of circumstances, safe, zero altitude/zero airspeed ejections have become a reality. Although successful ejections do not prevent accidents, they do preserve lives, and that's the name of the game.

**Naval Safety Center accident investigations.** In 1953 the Naval Aviation Safety Activity established a division of special aircraft accident investigators. The division is tasked to conduct independent aircraft mishap investigations of selected mishaps, primarily fatal crashes of the Navy's latest model aircraft. The investigators receive intensive training at a variety of locations such as aircraft manufacturers, engine manufacturers, NARFs, ejection seat manufacturers and the Navy's aviation safety officer school at Monterey, California.

In the past 30 years there have been occasions, particularly after a new aircraft has been introduced into the fleet, where a rash of similar mishaps have occurred for unknown reasons. This is the type of mishap investigation which the Safety Center's investigators are tasked to solve. Today, wherever in the world a naval aircraft is lost, if the wreckage is available for investigation and the cause is not readily apparent, the chances are excellent that a Safety Center investigator will soon be on his way to conduct an independent investigation. Safety Center investigators have been eminently successful in determining mishap cause factors in approximately 80 percent of all investigations conducted. Subsequent to such determinations, operators of that model aircraft are alerted to specific cause factors and other possible hazards.

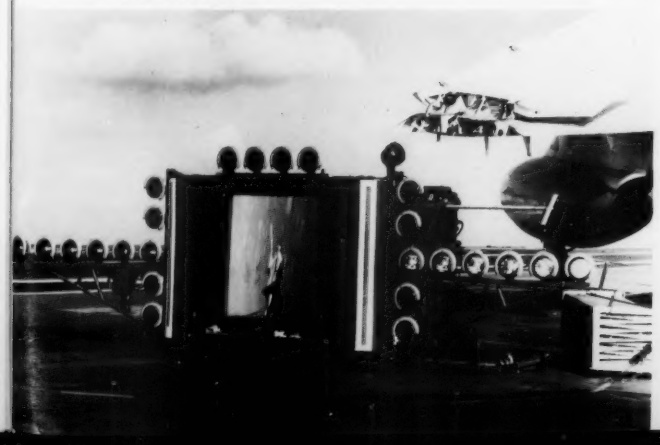
If just one aircraft mishap a year can be prevented as a result of Safety Center investigations, the yearly cost of operating the aircraft mishap investigation division will have been returned a hundredfold.

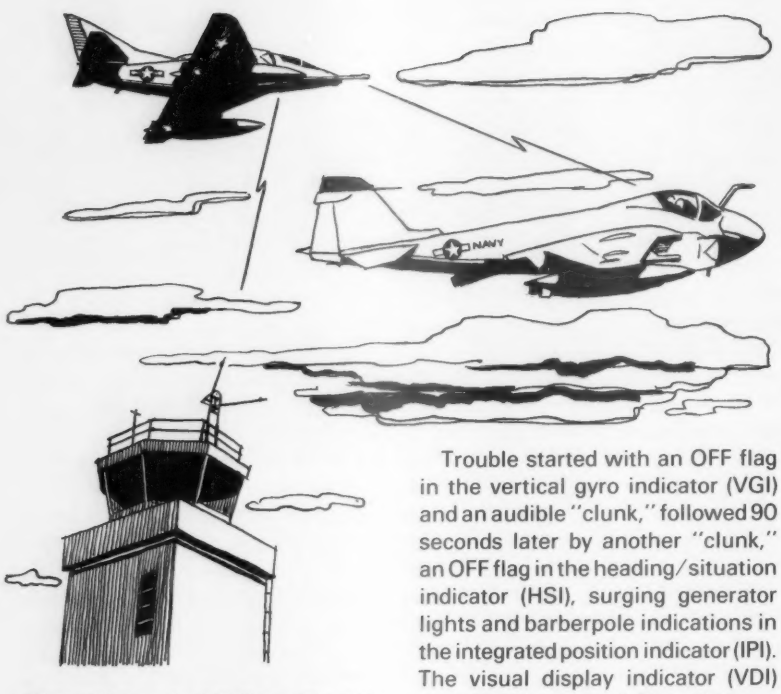
**RAGs (formerly Replacement Air Groups, now known as FRSs or Fleet Replacement Squadrons).** During World War II whenever a replacement pilot arrived at a squadron in the combat area, it often took three to four months before he was able to pull his own weight under all types of combat conditions. Such is no longer the case today because of RAG training. The RAGs came into being in the 60s. Now when a RAG graduate arrives at a squadron, the CO can expect to receive a fully qualified pilot in the model aircraft, in all phases of its employment including weapons training.

**The Barricade.** The 22-foot high barricade used aboard carriers during emergency landing situations was an aviation safety feature born of necessity. In the WW II era and for a few years thereafter, the cable type barriers were adequate to stop prop aircraft which for one reason or another were not capable of being arrested normally, e.g. having a tailhook broken off. With jet aircraft and their much higher landing speeds, an improved method was needed to stop them in extremis landing situations. The 22-foot nylon barricade was developed and has saved many aircraft from serious or strike damage. Before the advent of the angled deck, the barricade also stopped jets from plowing into aircraft parked forward on the flight deck. Although not designed to prevent mishaps, the barricade has certainly lessened the damage inflicted on aircraft when it has been necessary to recover them into the barricade.

If the next 40 years brings as many innovations and additions to naval aviation safety as I have seen in my lifetime, we should have nothing to fear about naval aviation's role of prominence in the next several decades. It's been a grand 40 years and if history is any teacher, it should be even greater in the years ahead. ◄

The original optical landing system — the mirror aboard USS *Saratoga* (CVA 60).





**A Total Electrical Failure.** The following article emanates from a VA-165 aviation safety message. Its content should prove of interest to all aircrews.

Recently, a VA-165 KA-6D experienced a total electrical failure while en route from NAS Cubi Point, RP, to USS *Ranger*. The failure occurred during daylight hours while the aircraft was holding IMC in Marshal at 18,000 feet. The crew was able to regain and maintain VMC and return to Cubi Point for an arrested landing. There were some valuable lessons learned from this seldom-seen emergency. The intent of this report is to share the actions taken by the crew, the reasoning behind their actions and to generate discussion of the various NATOPS procedures that must be considered with a total electrical failure.

Trouble started with an OFF flag in the vertical gyro indicator (VGI) and an audible "clunk," followed 90 seconds later by another "clunk," an OFF flag in the heading/situation indicator (HSI), surging generator lights and barberpole indications in the integrated position indicator (IPI). The visual display indicator (VDI) remained functional. The pilot suspected a No. 1 essential DC bus failure and immediately deployed the ram air turbine (RAT). Thirty seconds later, electrical fumes and smoke began to fill the cockpit. As the crew began to execute the smoke/fumes in the cockpit emergency procedures, all electrical power was lost. The pilot was already looking for an external horizontal reference.

Using the VGI, for about three minutes, the crew was able to descend through holes in the cloud layers. At 500 feet AGL, the aircraft was leveled and the wet compass was used to set up a heading for Cubi Point. Reaching the coastline, the crew recognized landmarks and was able to locate the entrance to Subic Bay. They then penetrated the area at 800 feet AGL to avoid an IFR departure corridor. At this point, the B/N used his and then the pilot's PRC-90 radios to establish what proved to be limited communications with Cubi tower. The B/N could hear the tower clearly, but the tower couldn't understand the B/N's transmissions. Fortunately, the KA-6D joined up on an A-4 circling overhead and the pilot of the aircraft relayed the transmissions.

The next decision the crew faced was when to land. Several factors are involved here — the amount of fuel remaining, the existing environmental conditions, other problems with the aircraft. The NATOPS Pilot's Checklist points out that the fuel gauges freeze at their indications at the time of failure. This, together with the known time of failure and estimated fuel flow, allowed the crew to approximate the amount of fuel remaining. The weather, though still marginal, was not deteriorating. The A-4 on their wing, upon request, took a look at the A-6 for any external indications of hydraulic leaks or fire. The A-6 crew then asked the A-4 pilot to request that a squadron aircraft already turning up on deck launch and join on them. The next problem was when to blow the gear down. With their A-6 wingman, the KA-6D crew began working their way back up through the cloud layers to 5,000 feet MSL to conduct slow flight tests. When initial attempts resulted in buffet onset at 170 KIAS, the decision was made to further burn down fuel. At the time of the total electrical failure, fuel indicated 5,000 pounds in the wings and 8,000 pounds in the main bag (the aircraft had launched with full internal fuel only). The crew elected to assume that the wings might not transfer. So, when they computed

that their main bag may have only 2,000 pounds of fuel remaining (total fuel 7,000 pounds), they began to make final preparations for landing.

The KA-6D was slowed until, at 165 KIAS, the aircraft began to lose lateral control effectiveness. The pilot then slowed to 160 KIAS to blow the gear down. The A-6 wingman reported that all three gear looked down and locked. The crew then went over the field landing specific notes for unsafe nose gear. Since the approach was to be a no flap/no slat to a field arrestment, another factor had to be considered — the maximum engaging speed for the E-28 gear the crew would be using (A-6 fly-in engagement is 164 KIAS).

The pilot flew a slightly fast approach at 170 KIAS and flared the aircraft just before touchdown to reduce speed prior to engagement. A wing rock occurred just before touchdown but was successfully countered with lateral stick inputs. After engaging the wire, the pilot, feeling no expected tug on the aircraft and anticipating a go-around, momentarily went to full power. The B/N was watching aft for a successful engagement and quickly relayed to the pilot that they had indeed caught the wire. The nose gear didn't collapse so the engines were not immediately secured.

The lessons learned from this incident are best summed up by the crew. They stated that they had to go through several emergency procedures in the PCL, none of which covered the situation entirely although all of them applied. Let's address the problems individually:

**Smoke in the cockpit.** In this instance, the amount of smoke was not a factor. If smoke were a factor, however, one of two actions would have to be taken; jettisoning the canopy (there goes any hope of hearing radio transmissions) or, cracking the canopy open (with the manual handle between the rudder pedals) until the smoke cleared.

**Communications.** With a total electrical failure, the PRC-90 radio becomes the only means of communications available. Will the rest of you who aviate be prepared to use yours on your next flight? Do you have the adapter that allows direct connection of the radio to your helmet or do you have to stick a plug in your ear? Do you carry a spare battery?

**Fuel management.** A critical factor facing the crew was how much fuel remained. While the fuel quantity gauge indicator does freeze at its last indication, it is only one of three important factors required to compute fuel. It is equally important to know the time the failure occurred and have a good idea of fuel flow. With a complete electrical failure, all fuel is supposed to transfer to the fuselage. An indication of droptank transfer should still be the familiar thumping as they empty — but how about the wings? There is no way to tell that the wings are indeed transferring. This, coupled with a previous incident this cruise of wing transfer failure, influenced this crew to assume that the wing fuel might not transfer.

**Main and Nose Gear Considerations.** We all know that NATOPS recommends 150 KIAS for blowing the gear down, but can the aircraft always be flown this slow? It can if the gross weight is reduced, but with no means of stores jettison or fuel dumping available, the only recourse is to burn down to an acceptable weight. Another problem is that the normal method of correlating airspeed to gross weight is no longer available since there are no angle-of-attack indications.

A rough approximation may be attained by slow flighting the aircraft and noting where it begins to lose lateral control effectiveness. NATOPS says this occurs 20 to 25 knots above stall speed in the clean configuration with buffet onset 7 to 10 knots prior to stall. It's risky but it's all that's left. Once the gear is blown down, there is no way to know that they are all safe. The slipstream should take care of the mains but it's working against the nose gear. Therefore, good headwork dictates that the crew should be prepared for the nose gear to collapse after landing. After clearing all of these hurdles and a successful no-flap/no-slat approach is flown to a field arrestment, the B/N can provide one last valuable piece of information by watching the arresting gear cable for a good engagement and then communicating this to the pilot.

This crew did an excellent job of analyzing this total electrical failure incident and then taking the best actions available to get themselves and the aircraft on deck safely. Would you have done the same?

The actual cause of this emergency is still under investigation but appears to have resulted from a left power control lever cable rubbing against a loose and misrouted wire bundle which in turn shorted the emergency (RAT) power cable and burned other electrical wiring.

*While this total electrical failure is rare, a similar event occurred to an EA-6B 15 May '83 at night in the Mediterranean. Thus, we have had two within the past year. — Ed.*

# "But There *Was No* Refusal Speed!"

By Lt. Dick Holloway
VP-30

THE situation begins normally enough, with a knock on your door late in the afternoon. The alert aircraft is being launched, and you have an hour to get airborne.

No problem — the crew is prepared and you all know what to do. The TACCO* hurries to get a quick mission brief, and the pilots head to operations to file a flight plan and check the weather. Thirty minutes after the initial call, everyone is onboard and ready to go.

Engine starts are normal and everything seems fine as you complete the takeoff checklist and get ready to roll. The flight engineer informs you that the aircraft weighs 135,000 pounds, rotation speed is 131 knots and that on this 8,000-foot runway there is no refusal speed prior to rotation, due to the early evening's cool temperature. "Sounds great," you say, "let's go."

You taxi the aircraft onto the runway; the tower clears you for takeoff, and you start rolling. In the back of your mind, you're quite pleased to think that you easily made your "hour to launch" criteria. At 80 KIAS, the power-check is fine and the P-3 continues to accelerate rapidly. Then it happens!

Just as you expect the 2P to call "rotate," the engineer yells, "overspeed No. 1!" No sweat — you're ready to abort,

*Tactical Action Officer: the crewmember in charge of the antisubmarine warfare mission.

and this one would be simple. You call "E-handle No. 1,"** while closing the power levers and commence your three-engine reverse. Having done this hundreds of times on training flights, you know you can handle it. You're below refusal speed, so stopping will be a piece of cake. You think to yourself, "just watch me keep this baby on the centerline, you guys."

Passing the 2,000 feet remaining board, you suddenly realize you aren't slowing down as quickly as you need to. What's wrong? You increase the reverse and get on the brakes as hard as you dare, but it's too late. You depart the runway at about 20 knots and stop in the weeds a few yards beyond the overrun. You see your career "pass before your eyes" and wonder what went wrong. There was no refusal speed, so why didn't you stop?

Refusal speed ($V_R$) for a P-3, is that speed below which the takeoff can be safely aborted on the runway remaining. That speed is based on stopping the aircraft with three engines at ground idle power (approximately 90 percent of available reverse thrust) and *hard wheel braking*. Few pilots normally use all (or even 90 percent) of available reverse on aborts, and even fewer are familiar with hard wheel braking. At the reduced gross weight used during training flights, the aborts can easily be accomplished with reduced reverse and little or no braking, but what about at 135,000 pounds?

Let's review reversal techniques first. Five to six years ago, some instructor pilots were teaching student P-3 pilots to actually bring the power lever into reverse asymmetrically to avoid a swerve! If you carefully observe the average pilot attempt an engine-out reverse, more often than not you'll notice that the rudders stay fairly neutral while the power levers are fanned back and forth to facilitate directional control. The average power lever position is nowhere near max reverse or even ground idle! Can you see trouble coming?

Now let's switch momentarily to braking technique. I doubt that there is a P-3 pilot anywhere who hasn't been corrected at least once for using too much brake or accidentally hitting a brake on the runway. Our brakes are high-capacity, they heat up easily, and consequently we tend not to use them. That's fine most of the time, but how many P-3 pilots even know what hard wheel braking feels like? Probably not many.

Let's go back to the original scenario and see what went wrong. Heavyweight takeoffs on 8,000-foot runways are routine on deployments. One hundred and thirty-one KIAS is the correct rotate speed, and with a dry runway and cool temperature there normally won't be a refusal speed below 131 KIAS.

So in our example we're accelerating toward 131 KIAS, and at 128 KIAS the FE called "overspeed No. 1!" By the time the power levers were closed out and the E-handle pulled, we were probably at 130 KIAS. Still we're all right as we quickly begin to reverse. So far, so good.

Now come the problems. Because our PPC was taught to avoid swerves by babying the power levers (if he were taught to use his rudders and ailerons properly he could use *max* reverse on most aborts) he retards No. 2 to max reverse, No. 3 to around ground idle, and No. 4 to approximately the start position. The result is a total amount of reverse thrust *less* than three engines at ground idle power.

Now the problems continue, although the aircraft is beginning to decelerate slowly. The PPC in fact doesn't even realize that hard wheel braking is the criterion for figuring refusal speeds. At 135,000 pounds, NATOPS lists 113 knots ground speed as the maximum for brake application.

Now let's review the big picture. The initial abort procedures were performed quickly and correctly, and the aircraft began decelerating. Had we gone to max reverse or ground idle thrust immediately and commenced braking at 113 knots everything would have been fine. But we started out with less than ground idle thrust because we wanted to avoid a swerve, and in our example we said that the brakes were finally applied after we passed the 2,000-foot remaining marker. So now we're at max reverse and max braking, realizing that we're running out of runway.

This story would probably end in one of three ways: (1) like the pilot (you) in the story, the realization that things weren't going well came too late, and the aircraft ran off the end of the runway; or (2) the pilot realized just in time that he was not slowing, and he went to full reverse and hard braking in time to stop, learning a valuable lesson in the meantime; or (3) the pilot got on the brakes too hard when he realized he was in trouble, blew some tires and ended up in the weeds.

The lesson of the story is simple. Let's start teaching P-3 pilots to properly use rudders and ailerons for runway directional control, so that we can use all of our reverse thrust for stopping the aircraft. Many pilots don't realize it, but most full-stop evolutions can be completed, even on three engines, with *max* reverse maintained continuously, if rudders and ailerons are used effectively down to reasonable nosewheel steering speeds.

Second, lets's stop teaching P-3 pilots to be afraid of the brakes. True, it is necessary to utilize some restraint with the use of these high-capacity brakes, because they can heat up easily with overuse. But the brakes are there for a reason — to help stop the aircraft! If we teach pilots to be afraid of brakes, they won't know how to use them when they are needed.

So if you're a P-3 pilot, ask yourself this question. If you lose an engine near rotate speed during a heavyweight takeoff roll, will you stop in time? Being below refusal speed does not guarantee that the abort will be a "piece of cake."

**Emergency shutdown handle for the No. 1 engine.

As a single seat attack pilot who understands the value of hugging the terrain (beneath radar envelopes), I can confirm the principle on which this article on turning is based. Although the authors' approach may be a bit technical and quantitative, the bottom line is a cold, hard fact . . . level turns at low altitude require an understanding of the dynamics of accelerated flight and strict concentration on control forces and flight path.
12 I am sure this discipline is equally pertinent to the fighter in low altitude combat or the S-3 or P-3 over a tight submarine datum. Unless you're a test pilot involved in the daily routine of exploring turning performance, you will profit from the reading of this well written USAF article.

Commodore Jerry C. Breast
Commander, Naval Safety Center

# Some Physics of Turning — Critical at Low Level

By Capt. Milt Miller, 162nd TFG
and
Col. Grant B. McNaughton, MC, Directorate of Aerospace Safety

EVERY year, we see a number of collisions with ground (CWG) mishaps which lead us to believe that there may be an inadequate understanding of some basic physics of turning. A common pattern in many of our CWG mishaps combines *turning and looking* — turning at a high bank angle, and simultaneously looking at something other than the nose track relative to the horizontal. The closer you operate to the ground, the more important it is to bear the following points in mind.

- To start a level turn, the nose track needs to be visually cross-checked to ensure the nose doesn't drop.
- To maintain a level coordinated turn, the number of G must equal

$$\frac{1}{\text{cosine bank angle}}$$

as shown in Figure 1. (This is based strictly on lift; no allowance is made for vertical side forces generated by the fuselage and tail at higher bank angles.) For example, a level

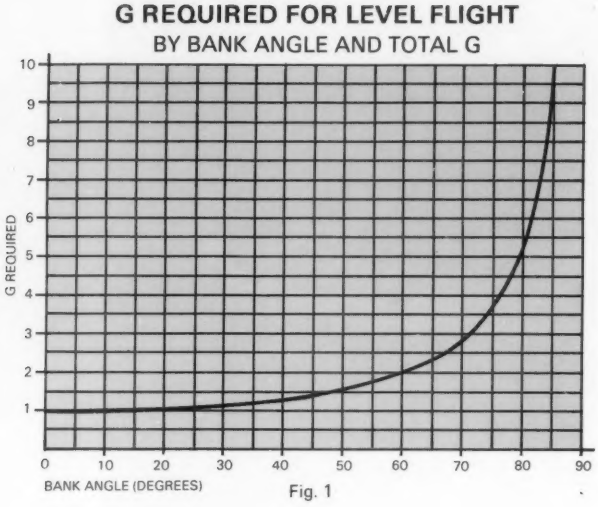


Fig. 1

60-degree banked turn requires 2G, 70 degrees about 3G, 75 degrees about 4G and 80 degrees about 6G. Note also that at 85 degrees, over 11G is required, and that at 90 degrees, the number is theoretically infinite.

• If the G is insufficient to maintain a level turn, the pull of gravity will cause the aircraft to fly a descending path. The formula for the altitude lost or distance (d) is: $d = 16.1$ (G multiplied by the cosine bank angle minus 1) $t^2$, where G = G on aircraft, and t = time in seconds. Figures 2, 3 and 4 are based strictly on this formula; they make no allowance for changes in velocity vector.

• If a turn is unmonitored, it is very easy to overbank. Whereas 2G will hold a level 60-degree bank, if you inadvertently overbank to 70 degrees while holding only 2G, Figure 2 shows you will lose 200 feet in less than 6.3 seconds. If you inadvertently overbanked to 80 degrees while holding 4G (sufficient to hold only 75 degrees), you'd lose 200 feet in under 6.4 seconds.

Figure 3 shows what happens when G are held constant (in this case two), but bank angles exceed 60 degrees.

Figure 4 shows the effect of a constant bank angle (in this case 80 degrees) with insufficient G.

• Note in the foregoing the importance of time: Altitude lost is a function of *time squared*. By the end of the third second, you will have lost nine times the altitude as at one second; by the end of the fifth second, 25 times the altitude as at one second.

• Whereas altitude AGL provides some safety margin while wings level, the margin evaporates when turning. See Figure 5 to compare times to impact (TTI) from our common "step down" altitudes with a one degree wings level descent versus step overbanked turns. Doubling air speed halves the TTI in the wings level descent, but airspeed has a negligible effect on TTI from overbanked turns, until

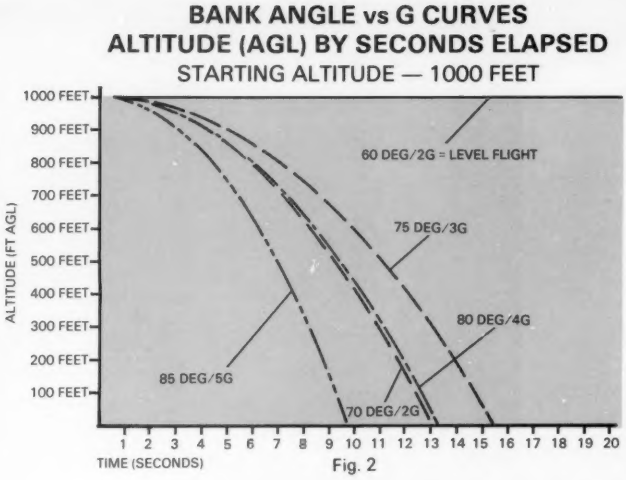


Fig. 2

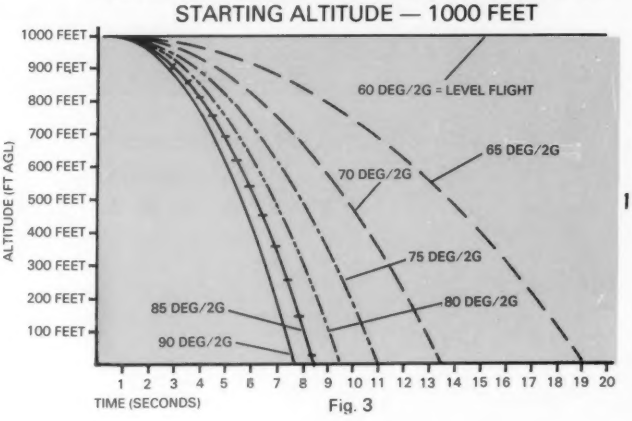


Fig. 3

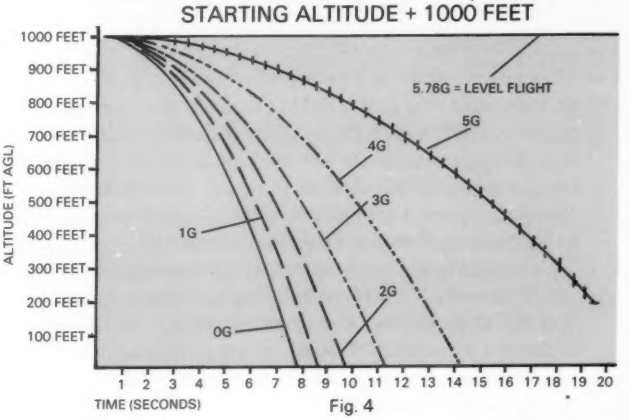
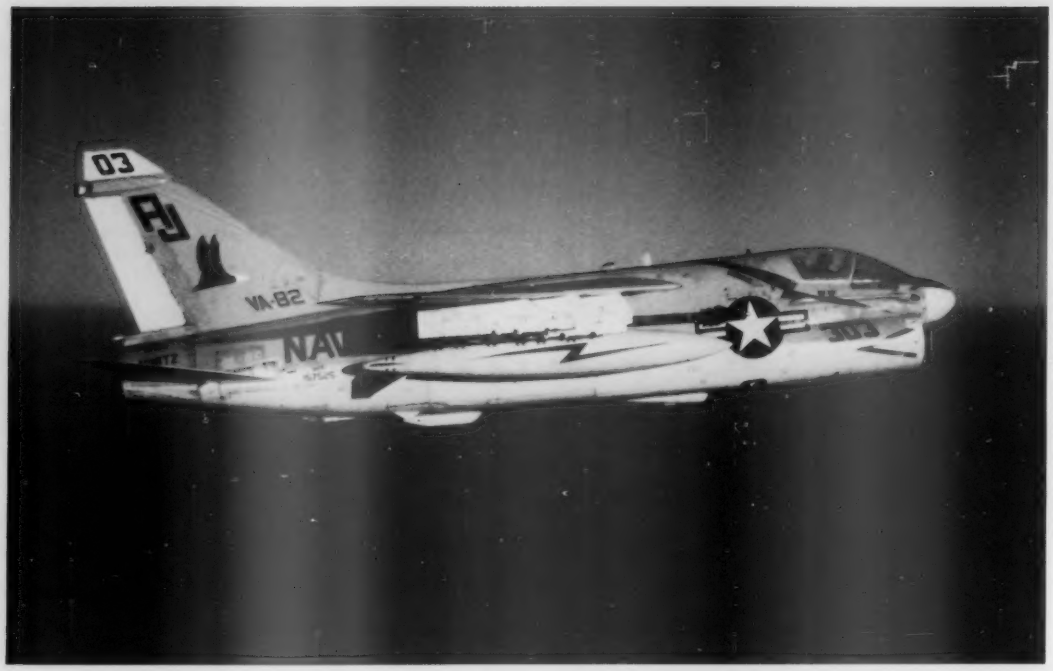


Fig. 4




**Time to Impact (TTI) In Seconds**

| | Wings Level Descent: -1° | | Overbanked Turn | | |
|---|---|---|---|---|---|
| AGL | 240 KIAS | 480 KIAS | 85°/4G | 90°/any G | 95°/5G |
| 100 FEET | 14 | 7 | 3.0 | 2.5 | 2.1 |
| 300 FEET | 42 | 21 | 5.2 | 4.3 | 3.6 |
| 500 FEET | 70 | 35 | 6.8 | 5.6 | 4.5 |

Fig. 5

you bank significantly past the vertical and continue pulling positive G.

From the above, note what happens on a level break turn using 90 degrees bank from 100 feet AGL: one-potato, two-potato, three po — crash! From five times that altitude AGL, the time to impact is only slightly over twice as long. What happened to all that safety margin?

Any time you initiate a steeply banked turn at low AGL altitude, snap your eyes forward out the front of the aircraft to immediately detect any nose drop to the inside of that turn. If you are only 100 feet AGL, you will have to catch that nose drop within the first second to prevent impact by the third. The most critical control input to prevent impact is to immediately decrease bank, then increase G.

Some additional points regarding these graphs are:

- If the altitude lost represents time to impact, you should realize that the point at which recovery is no longer possible is reached considerably sooner. There are multiple factors affecting this point of no return; among them are velocity vector; angle of attack; roll rate; G available; airspeed; aircraft weight, CG, and symmetry; density altitude; changes in terrain elevation, and pilot reactions.
- At 90 degrees of bank, you fall like a rock, regardless of G. Past 90 degrees, with positive G, you are directing your lift vector toward the surface; you'll get there ahead of the rock.
- Note that airspeed is not a player in how fast you fall with insufficient G for your bank angle until you roll past the vertical. It does, however, affect the impact point, as well as such factors as G available and turn/pullout radius: Faster movers go farther while falling, and though they may have more G available, use up more room turning or pulling out.

To recap, turning and looking at something other than your nose track can get your nose started down and can lead to overbanking. Overbanking (turning at high bank angles with insufficient G) loses altitude. The amount of altitude lost is a function of the square of the time at that high bank angle. Time is therefore critical.

Unfortunately for us humans, our sense of time is not particularly accurate nor even constant. Sometimes it runs a little fast, sometimes a little slow. As a rule, when we are concentrating on something, distracted either inside or outside the cockpit, excited, stressed, preoccupied or otherwise having a good time, it's safer to assume that time flies. Like one of Murphy's Laws, things always take longer than you think. Judging from many of our CWG mishaps, pilots sometimes do allow themselves to become inattentive to their flight path for excessive periods of time.

While turning at low altitude, you may have only a second or so to prevent CWG. **Turning and looking at low level is a death act.** There simply is no margin for that kind of error.

*Adapted from* USAF Flying Safety magazine *Sep '83.*

# Good Enough is Not Enough

By Lt. Randy Mahoney
VQ-4

IT's another zero-dark-thirty preflight. While the pilots file, the rest of the crew completes their preflight preparations and are off for another 10-plus hour flight in the trusty C-130 Hercules. We will remain airborne until relieved on station. About halfway through the mission in the oceanic environment, something on the hydraulic panel catches the flight engineer's eye — a utility system overpressure. We break out the NATOPS cruise engine shutdown checklist... but now the pressure's OK again. It stays at about 2900 psi, a bit low but within limits. Since there's no way to identify which engine-driven pump was malfunctioning, we press on.

Just after daybreak, red hydraulic fluid is seen on the No. 1 engine nacelle. The engine is shut down. That pump must have been the bad one. Only two hours from planned destination and six hours of fuel remaining. No sweat, right? Since there's a possibility of contamination, the rest of the utility system is secured in order to save it for the approach and landing. The Herc's utility system powers half the flight control boost; flaps, gear, nosewheel steering and normal brakes. Anticipating a hydraulic pump change, we request a divert to a base with C-130 maintenance facilities.

Near the end of the on-station time, we are tasked to remain airborne until prudent limit of endurance. Max endurance is set. Time is 1015 local. Relief's at noon, descent is started. The copilot restores the utility system switches, but for some reason there's zero pressure. Funny — it worked great when it was secured. Now we are faced with a three-engine landing under degraded control. A thorough review of NATOPS procedures, a great deal of hand-cranking, and we are finally configured to land. With a light wind, a long runway, and a little sweat, we're safely on deck.

What went wrong??? Postflight inspection revealed a highly contaminated hydraulic system. Bits of metal up to two inches long were found in the filter bowls. Apparently, No. 1 pump had slowly destroyed itself, sending metal shrapnel throughout the utility system. As filters became clogged, they eventually went to full bypass and allowed metal to further contaminate the system. The precautionary shutdown of the remaining utility pump did not save it — the damaging metal particles only recirculated for hours in its runaround circuit, thus destroying that pump also.

As the squadron ASO, I have to ask myself, "What can we do to prevent similar incidents in the future?"

**Really read the previous flight's maintenance action forms.** The utility system overpressure had been "griped" before. The fact that the hydraulic shop could not duplicate it should have made us skeptical, and *we should have asked if a patch test had been made for contamination.* (It had not.) Had the patch test been conducted prior to the flight, it might well have downed the aircraft.

**Know your aircraft systems — THOROUGHLY.** "Just enough" system knowledge to squeak by your annual NATOPS closed book test is *not* enough. Knowing exactly how pressure is regulated in C-130 hydraulic systems is one example: A momentary overpressure encountered on a previous flight was a symptom of a very serious malfunction — not just a meaningless "glitch."

Especially in shore-based, multiengine aircraft, we can easily get lulled into a false sense of security. A vigorous, professional attitude toward flight responsibilities may well mean the difference between a close call and something worse. ◄

# *It's Really Happening to Me!*

By Cdr. J.E. Mann
HC-3

"BUCKLE up."

"Seatbelts save lives."

"With a little help from my belt."

"Seatbelts are required on this base."

There are a host of slogans around to remind a person to wear seatbelts. A few years ago the message was vividly brought home to me in a manner which still turns my stomach when I think about it.

I was driving the 10 miles to work and listening to a local news radio station. The two commentators were discussing an aircraft disaster. Being an aviator myself, any report of an aircraft crash gets my attention. This particular morning one of the reporters commented that despite the tragic loss of life in the air crash, it was worth noting that people on the nation's freeways have 50 times more chance of injury or death than those on the nation's airways.

"So," I thought, "more safety propaganda: You can prove anything you want with statistics."

But the news analyst continued to say that without seatbelts, an individual's chance of injury or death in an automobile rose from 50 times that of an aircraft to 150!

Even if it was unverified, unqualified or biased, 150 times the risk caught my attention like the master caution light illuminating. It made sense — I wouldn't consider starting engines or engaging rotors without strapping in. How then could I take so lightly my disregard for the same safety equipment so often left on the floorboard beside my seat? That very morning I reached down, wiped the dust off my seatbelt and strapped myself into my imported pickup as I proceeded inbound to work.

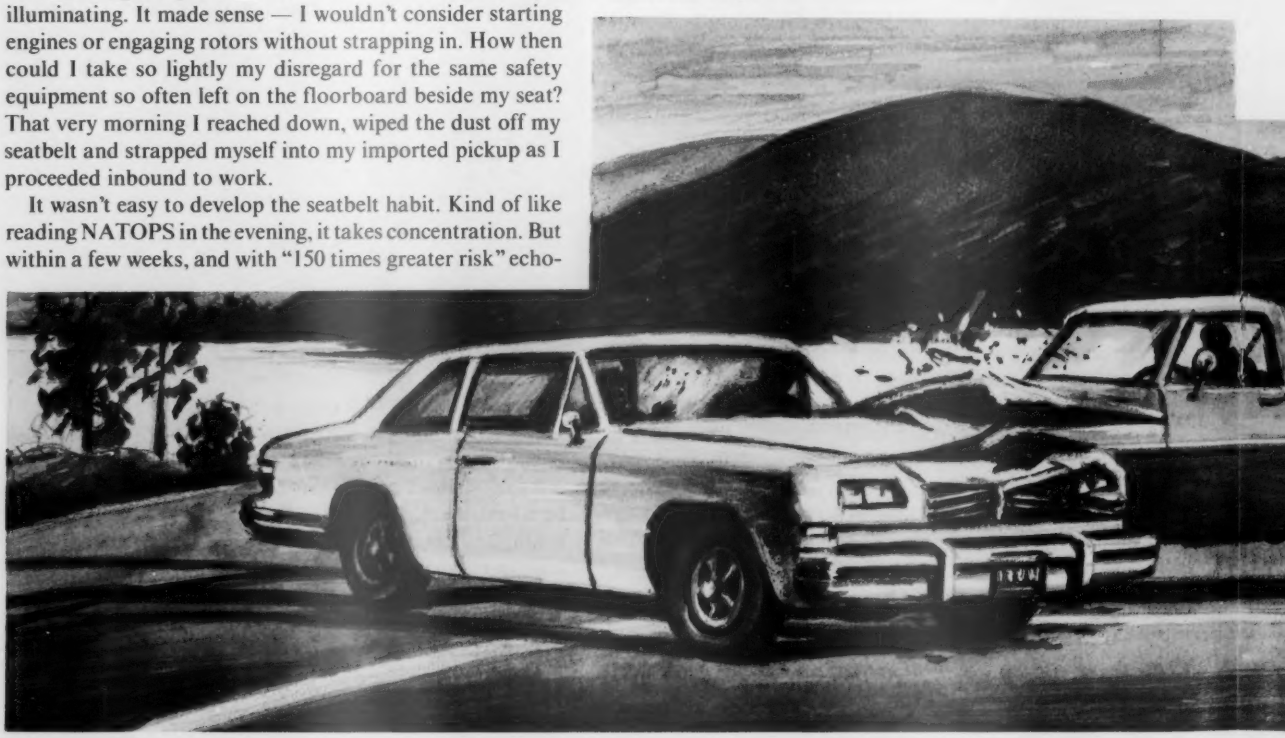
It wasn't easy to develop the seatbelt habit. Kind of like reading NATOPS in the evening, it takes concentration. But within a few weeks, and with "150 times greater risk" echoing in my brain, I had developed the seatbelt routine. Like flying the aircraft, buckling up had become second nature to me and I actually felt uncomfortable without the reassurance of that familiar "click." I didn't know at the time that the relationship I had established between flying my aircraft and driving my automobile would in fact save my life.

One misty morning at 0700, I strapped in my truck and set out for work as usual. With a light rain falling I thought, "One of those days, I'll probably have to file IFR just to get to the offshore training area. Gotta get a new set of wipers for this truck."

As I watched my wipers streak the water on the windshield, I noticed the headlights of a 1970 Buick swerve around the curve ahead. The rear of the vehicle was skidding off the edge of the roadway and fast approaching a river bank. My initial thought was, "It *is* going to be one of those days! They're going into the river. I hope I'll be able to get them out."

The driver of the car fought to bring his vehicle under control and successfully reversed his slide toward the river.

"Holy _____! He overcorrected and is sliding across the centerline! Hold on, brakes, try to get over to the embankment on the right."



When faced with an impending catastrophe, I considered the alternatives just as years in the cockpit had taught me. But sometimes there just isn't an out.

"*%*&*@ It's really happening to me!"

I could see the panic on the other driver's face and his passenger appeared to be floating in the front seat as my left headlight slammed into the driver's door. There was a loud, sickening smash. My import held its ground surprisingly well at first, stopping the other vehicle cold. But my lighter vehicle rebounded from the first impact and bounced back 27 feet before coming to rest.

Like a combination ejection seat trainer and Dilbert Dunker (sans water, thank God), I took a quick but wild ride. Reacting instinctively as I'd so often briefed my helo copilots, I waited until all the motion had stopped, took account of myself and recaged my brain. I felt like I'd been punched in the stomach and I was covered with pieces of glass.

Not so for the occupants of the gas-hog. The driver was half in — half out of his crushed door and bleeding badly while the passenger was frantically trying to extricate his head from a small vent window. They needed help fast.

As in the aftermath of an aircraft mishap, planning my egress became a primary concern. My door was compressed about six inches with no possibility of being opened. The other door was blocked by my truck's 2000cc engine, which sat smoking in the middle of the cab. I'm glad I was restrained to my own side of the seat when it pushed through the firewall. The front and rear windows were gone, so sliding out the rear window appeared to be my best option for escape. But I couldn't get out, I was stuck somehow! Fighting a feeling of panic coming over me, I realized that the seatbelt which saved my life was now restricting me. I released the belt buckle, which worked as advertised. I slid out the rear window, carefully avoiding the hot engine and trying not to get grease on my clean uniform. Once out of the truck, I found myself up to mid-calf in mud. So much for the clean uniform. It was already one of those days. What else could go wrong?

The passenger of the big Buick was still stuck when I reached him. His head had knocked out the glass in the window vent, and he was bleeding from the cuts. As I approached him, he was trying to grasp his face and talk. He had literally eaten the rear view mirror in the crash.

I carefully removed the mirror from his mouth, which came out accompanied by a few teeth and an amount of blood. Once capable of speech, he had a few choice comments about the driver. I told him to relax and that we'd have to work together to free his head.

About this time a fellow naval officer stopped to see if we needed help. After viewing the scene and gagging, he sped off saying something about an ambulance and that I wasn't supposed to be wearing my flight jacket off base. He must have been a black shoe, but I really don't recall. Finally, I freed the man's head after forcing out the window vent guide.

A quick assessment of the man's condition revealed several broken and dislocated fingers on his right hand and a broken left collar bone where he'd hit the steering wheel while flailing about the vehicle. All we could do for the driver was ease him back into the seat and wait for help.

The highway patrol, paramedics, fire truck and ambulance soon arrived. Everyone thought the passenger in the Buick had been the driver of my pickup. They couldn't believe I'd survived untouched. Despite my healthy appearance, a patrolman directed me to take the ambulance to a nearby hospital. I rode in the front seat and it still cost $85.00!

Much later, while waiting my turn in the emergency room, a highway patrolman briefed me on the accident. The driver of the other vehicle had been drinking, was late for work and was speeding in excess of 80 mph when he lost control. Combined with my speed of about 45 mph in the opposite direction, the impact was like hitting the ramp on a 110-knot approach. I'm convinced that my seatbelt saved my life.

Neither of the other two persons in the mishap were wearing seatbelts. The passenger received multiple cuts and bruises in addition to the injuries previously mentioned. The driver sustained a broken ankle, pelvis and shoulder as well as a severe concussion.

Finally it was my turn to see the doctor. X-rays showed that the pain in my stomach was caused by more than just bruised tissues. The impact had caused my stomach to perforate my diaphragm.

So, after two hours of waiting, an 11-man trauma team arrived with everything but an external power cart.

As the doctor smiled and said, "This is going to hurt," I knew that "one of those days" was not over yet.

# NATOPS

"MORNING, sir. I'm the SDO and the XO said to be sure to wake you in time to get to the readyroom for today's safety standdown."

"I know where your room is, Puff. I'll remember this." Slam.

"Hey, Cougar Breath. Get up! The XO wants your armpits in the readyroom in 10 minutes! Safety Standdown Day."

"I can't move, Duke. I think I caught polio during the night. You'll just have to call and tell . . . safety standdown! Do you think that XO knows that I have Betsy Breathes-Easy, the CPR training device?"

"That, gentlemen, concludes the structured presentations for this safety review. I sincerely hope that each and every one of you enjoyed the surprise TACNOTES quiz and the flight surgeon's discussion of rare tropical ailments. Now, please break up into your normal crews to conduct an emergency procedures review. I regret that we couldn't present the scheduled CPR training, but I am confident that you gained some information that will enable you to better cope with the Sea King and its quirks. I, personally, have been most excited throughout . . . ."

"Hey, yo! Can we watch 'Man From Lox' again?"

"Uurp!"

"What was that?"

"That was Cougar, Sir. He ate seven rollers with onions at midrats last night and his stomach is upset."

"Thanks, Cougar. OK Buffy, let's sit down over here and go over some emergency procedures."

"Yes, sir. I'm sure that I can give the proper response to any emergency."

"Yeah? OK, let's say that we are motoring along one night and you see a wisp of smoke rise from near your feet. What are you going to do?"

"Uh, what kind of smoke? I think that I may need some more information."

**"Morning, sir. I'm the SDO ooooh!"**

# and the Duke

By Lcdr. Marty Fox
HS-5

"You do? What do you think is going to happen in a real aircraft not on a NATOPS check flight? Are you going to wait for a caution light to illuminate and say, 'Excuse me, you are experiencing aircraft malfunction number 38? Real problems start with a wisp, a shudder, an odor, a bump. The plan is to solve the emergency *before* the caution panel can be used as a night light. *What are you going to do?"*

"Well, I am going to assume it's a fuselage/cabin fire and break out the pocket checklist to see what procedures we should follow."

"Wonderful! Before you assume anything, how about *thinking first!* What's below your feet? Electronics?"

"Uh, that's right. It must be an electrical fire. I'll go to that emergency procedure in the checklist and . . . ."

"How about hydraulics? Any plumbing there? A pinhole in a hydraulic line might look like smoke."

"OK. Yeah, uh, we'll go to the checklist under hydraulic failures. We can . . . ."

"Which hydraulics system? Primary? Auxiliary? Utility? Any? Why don't you ask the crewman to look in the electronics compartment and tell you what he sees? Let's say it is electrical. What page is the proper procedure printed on? It's as dark as flying in a glass of Ovaltine, and we may lose our lights pretty quickly due to the fire. How much time do you think we have for you to thumb through the checklist, after you find it, if you can see it? You're betting your buns on your ability to successfully find and read the proper emergency procedure."

"But, sir, they said that I didn't have to memorize most of these procedures."

"Whoever told you that said it while he was sitting in a readyroom or a trainer, and *he* had already memorized his procedures."

"Yeah, maybe, but NATOPS says that it will denote memory items. These procedures are not marked as memory items."

"You are a *banana* if you believe that! OK, for your sake, let's not say 'memorize.' Let's say R-E-A-L-L-Y know the procedures. Remember, slick, we are never more than 400 feet from the water and *we are in* the rescue vehicle."

"I may see your point, Duke."

"OK. Next, let's look at some other stuff . . . . What's the matter, kid? You look a little funny."

"I wish Cougar would go somewhere else."

"He's *Lcdr. Breath* to you, sailor! Let me tell you something about him. Do you know that he shoots *every* approach as if he were single-engine? That's in case he becomes single-engine on the way in. He reads and re-reads his emergency procedures *every* Tuesday. Then he bothers me with a whole bunch of "what if" scenarios to see what I would do in that case. Then he argues about my choices with me. The rest of the week he wanders around to all the shops and asks those guys questions about how the various systems really work in the aircraft. He spends just a few minutes a day, a couple of hours each month, learning his aircraft and worrying about how he'll handle that wisp of smoke, bump or thump. He still has time to do some movie watching, letter writing and paperwork procrastinating."

"Everybody knows he's a good stick, sir."

"Wrong. He's a good *aviator.* He knows his aircraft and all its systems. He is READY to take quick and correct steps to solve any emergency. Even the ones where NATOPS admits that it is not a substitute for sound judgment and modifications of its procedures may be necessary."

"Now get away from me and don't tell me you can give me the proper response to any emergency until you can."

"But I know my NATOPS, Duke. At least as well as any guy should."

"Yeah? One more chance. Late afternoon with the sun in your face. You're my copilot. You're in the left seat and we are doing a pax transfer to a smallboy by hoist. As the Chaplain gets halfway to the deck, we start to lose an engine. I can't take this guy with me over the side — it will kill him. I yell, 'jettison the hoist then give me full power!' Got the picture?"

"Yes, but what is the question?"

"Knowing that *any* delay will cost us either the aircraft or the man on the hoist, probably both, which position on the jettison panel is the hoist?"

"What? No one knows that! I'd have to look at the panel, Duke."

"Fine. *You* don't know it now, but there is the place to learn it — not during the emergency in the aircraft? Really know NATOPS."

"Come on Cougar. Let's get you some chow. You're starting to show signs of one of those tropical diseases the quack was talking about." ◄

# Fatigue

By Lcdr. Janet Markle, MC
VP-16

FATIGUE is a part of operational naval aviation and is something every flier will experience. The most severe and obvious case of fatigue is in the pilot who falls asleep in the cockpit, with potentially catastrophic results. Fatigue can be more insidious, however, and quite long-ranging in its effects and onset. It can be aggravated by a host of contributing factors such as poor nutrition, minor illness, wounds, emotional stress, boredom, time zone changes, aircraft vibration, sleep deprivation, age, experience and personality. All of these can interact to produce a dangerous situation.



Fatigue is most often described in terms of sleep deprivation but is actually more than a sense of sleepiness. It can be a subtle wear and tear that leads to incoordination, inattention and poor judgment. Fatigue can be measured by counting the number of mistakes an individual makes while performing a simple physical task. "Performance decay" is noted before the individual actually feels tired and is the first sign of fatigue. Couple this setting with the poor judgment accompanying fatigue, and you can easily see where an individual can make small errors he does not even recognize. Missing these tiny errors or missing small cues, such as slight oil pressure fluctuation, is called "blocking." Major cues are noticed, minor ones are missed. Also, missing instruments during cockpit scan, inappropriate fixation on a gauge or other environmental cue occurs, i.e. target fixation can occur. An increase in fatigue is associated with more blocks, as well as lower standards of performance and discipline. You may not even notice your own level of fatigue until your errors are major.

The human body and its physiological functions are strongly controlled by the biological clock, a 24-hour day-night variation or rhythm of body functions called the

circadian rhythm. This includes body temperature, alertness versus sleep, eating and appetite, hormone levels, performance and behavior. Mental performance and memory is high between 0800 and 1400 hours and then drops off during the afternoon. A study of aircraft mishaps showed a high level of mishaps for flights originating between 1800 and 2100, and 2400 and 0900 in tactical aircraft and high levels between 2100 and 2400 in helos. All of this simply means that at night the aviator is being asked to perform at maximum capacity, when the body is saying, "It's time to sleep — I'm not ready for work."

Multiple time zone changes affect the susceptibility to fatigue. This is probably due to the length of travel and the confusion of the biological clock. A study determining effects of time zone changes on performance (using performance testing) showed that after 48 hours, an individual was only 50 percent "recovered" from the change in time zone.

The flight environment itself is fatiguing. Aircraft vibration and noise increase the body's fatigue. Depending on the type and frequency of aircraft vibration, one can have a variety of problems including visual or motor problems. Multiple muscular and skeletal problems might be associated with vibration, including joint and tendon problems. Because of mild pain, these conditions could lessen attention capacity and increase the effects of fatigue. In addition, the pressurized air at altitude is extremely dry. It is easy to become dehydrated through breath and sweat.

Dehydration contributes to fatigue and performance decrement. Coffee, or other caffeinated beverages, will compound this factor of fatigue due to the effect on the urinary system. Water is a better choice under these conditions.

Illness and wounds require a great deal of the body's energy as the body heals itself. Pain and discomfort reduce the ability to withstand stress, both physical and emotional. Susceptibility to fatigue is greatly increased.

Emotional stress contributes in that it causes increased inattention (mind tends to wander to the stress-causing incident instead of the task at hand). In addition, severe depression causes a sense of fatigue in and of itself, and is associated with sleep disturbances. Boredom also causes inattention and a sense of fatigue.

Operational fatigue is an accumulation of effects from intense operations, demanding flights, long hours and irregular patterns of meals and rest. Talk about confusing the biological clock! This will really do it! A person may appear normal, but he will function mechanically, and mental alertness is not there. There is evidence, however, that young, healthy, highly motivated people can perform for quite long periods of time before operational fatigue causes a measurable drop in performance.

Fatigue is an unavoidable fact of life in naval aviation due to the nature of operations. Attitude and motivation do a lot to combat this type of fatigue. Compounding factors can be reduced by including rest time to account for unusual launch times or time zone changes, eating balanced meals and allowing adequate fluid intake. Don't fly when you're ill or wounded (talk to your flight surgeon instead), and if your personal life is causing problems, talk to someone about it. Most of all, enjoy what you're doing. ◄


REFERENCES:

Borowsky, M.S. and R. Wall. Naval Aviation Mishaps and Fatigue. Aviat. Space Environ. Med. 54 (6): 535-538, June 1983.

Doyle, R. Circadian Rhythms and Fatigue: A Discrimination of Their Effects on Performance. Aviat. Space Environ. Med. 53 (11): 1131-1136. Nov 1982.

U.S. Naval Flight Surgeon's Manual, second edition, 1978.

Wegmann, H.M., et al. A Model for Prediction of Resynchronization After Time-Zone Flights. Aviat. Space Environ. Med. 54 (6): 524-527. June 1983.

Quack's Corner COMNAVAIRLANT message 03 AUG 83.


**Physiological Changes Seen With Fatigue**

- ▼ body temperature
- ▼ strength
- ▼ blood sugar (glucose)
- ▲ pupil response time to light
  - (▲ time for natural eye reflex to light)
- ▼ binocular fusion
- ▲ time for visual accommodation
- ▼ circulating blood volume
- ▲ heart rate
- ▲ eye fatigue
- ▼ muscle glycogen (energy stores)
- ▼ muscle coordination and control

**Psychomotor Changes Seen With Fatigue**

- ▲ reaction time
- ▼ memory
- ▼ communication skill
- ▼ decision making (slower)
- ▼ tracking (following object with eyes)
- ▲ irritability, anxiety, depression
- ▼ attention span
- ▲ errors
- ▼ cooperativeness
- ▼ acceptance of criticism
- ▼ activity
- ▼ personal care

# Night Shots in a No Parking Zone

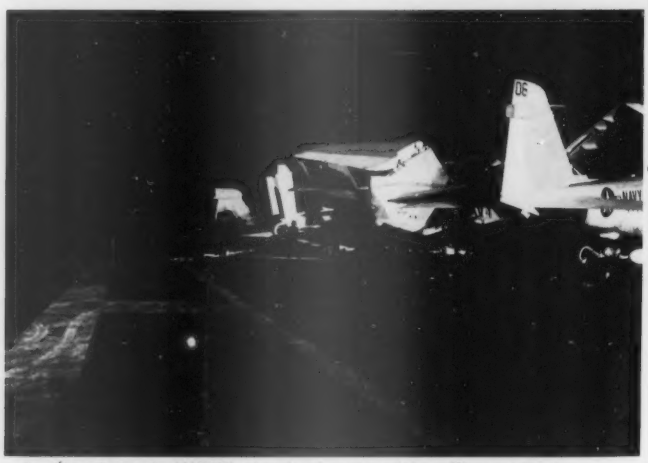


By Lt. Paul R. Senness
VAQ-132

SEVERAL minutes after what you thought was a normal night cat shot from cat 4, Air Operations gives you a call. "Viking 702, we want you to come back on this recovery. It appears your right wing hit an aircraft during launch." There are no control problems but the light on the right wing, like the night, is black. Then an astonishing transmission is heard. "I think you want Viking 703. I think we hit something on launch." Their right wing light is dark also, and the pilot perceives a light airframe buffet but no control problems. Pieces of fiberglass, plastic and metal picked up near the struck EA-6B on the port bow are taken to VAQ's maintenance control. The plane captain doing a turnaround inspection on the aircraft explains that the "football" (tail fin radome) is damaged. Some of the pieces are identified as belonging to an S-3. Uneventful Case III approaches are flown by both aircraft. Uneventful except for the fact that more people are anxiously watching the PLAT* than usual. On final there is no right wing light visible on 702. After trapping, the PLAT camera zooms in on the right wingtip as it folds. The damage is apparent. Several minutes later 703 traps and the scene is repeated.

As the aircraft shut down, people arrive on the flight deck to see the broken birds and speculate on the cause(s). Flight deck personnel and members of the Aircraft Mishap Board are gathered on the angled deck. Peering down the Waist Catapult Safe Parking Line (WCSPL), a discussion ensues as to whether or not the Prowler is across it. The blackness of the night and shadows cast by the aircraft make a concrete determination difficult. Time-lapse photos are taken and a low light night scope is used to view the scene. It's close, but too hard to tell (photo 1).

*pilot landing aid television



Looking down the WCSPL shortly after the mishap. The port horizontal stabilizer is completely engulfed in shadows. Had such a line existed for cat 4, the EA-6B would have been across it nearly 10 feet (photo 1).

*Editor's Note: The angle at which both photos were taken makes it appear that the deck was fouled for the recovery by the EA-6B's tail. It was actually clear.*

The following morning revealed the actual position of the EA-6B in relation to the WCSPL (photo 2).

The following morning the EA-6B is parked in the exact location as the night before. (Tire locations had been carefully marked on the flight deck.) And many of the same group of people are again looking down the same line. All doubts are erased. The port horizontal stabilizer extends into the forbidden zone about one foot (photo 2). Positive indication that the aircraft spotting was responsible for the mishap, right? Well, yes and no.

The first S-3 barely hit the radome of the EA-6B. It went completely unnoticed. The second S-3 (launched three minutes later) struck the radome about 5 inches lower and to a depth of about 6 inches laterally. Had the EA-6B been pulled forward the necessary distance to clear the WCSPL, the mishap would not have occurred.** That's the *yes* of the question.

The *no* answer results from comparing the wingspreads of the other aircraft in the airwing. With the EA-6B in its parked position, an A-3 would have struck 18 inches further in and an E-2 almost 5 feet. For either aircraft, there would have been a mishap and perhaps a lost aircraft/crew, even if the Prowler had been pulled forward the minimum distance.

To understand how this mishap occurred, take a look at the flight deck and some of its markings (Fig. 1).

On *Nimitz* class carriers cat 4 parallels the keel. Cat 3 is angled to port about 5 degrees. The NAVAIRENGCEN-91131 Visual Landing Aids General Service Bulletin describes explicity where and how flight deck markings are made. On the day of the mishap the guidance was: "The



** Editor's Note: The only WCSPL at the time was for cat 3 and the S-3 in question was launched from cat 4. So having the EA-6B clear of the line *may* have provided the necessary clearance but would not have guaranteed it.

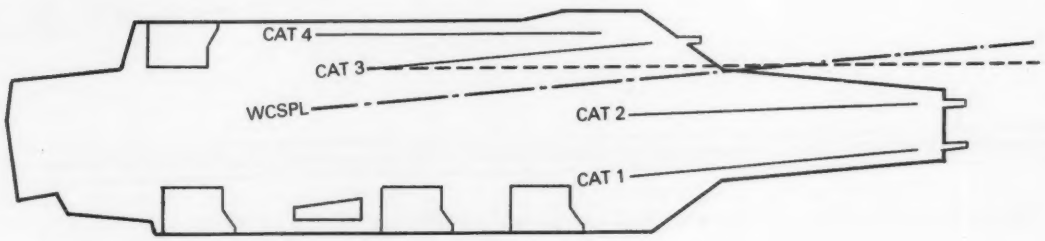



Fig 1. Representation of the flight deck, waist catapults and WCSPL (not to scale):
The dashed line is parallel to cat 4 indicating the intersection discussed in the text.

waist catapult safe parking line shall parallel the inboard-most waist catapult only at a distance of 42 feet." That distance provides a clearance of approximately two feet from aircraft parked along the line and a cat 3 launched E-2 (widest wingspan). By inspection it can be seen that if a similar line were drawn parallel to cat 4 it would intersect the WCSPL somewhere beyond the end of the angle deck. Shortly past this intersection the safety margin based on the WCSPL disappears for cat 4 launched aircraft. This intersection is at approximately frame 35 (about 200 feet aft of the bow deck edge). Any aircraft "butted" against the WCSPL forward of this intersection poses a significant conflict for large wingspan aircraft launched from cat 4. Scale drawings indicate that for the E-2, the starboard wingtip crosses the WCSPL about 175 feet from the bow. For the A-3 and S-3 distances are about 130 and 115 feet respectively (Fig. 2).

Until this mishap occurred there was apparently no knowledge of the conflict. In fact, flight deck personnel generally believed that the first three aircraft spotted on the forward port bow could not foul the waist catapults. No one could recall a problem of this nature ever being discussed during their training at formal schools or on the job. It is remarkable that *Nimitz* class carriers have operated all these years without this problem coming to light. One possible explanation may be in how the WCSPL is used and this author's view of its designed use.

Prior to each launch the catapult officer and safety petty officer check the catapults and clearances on the deck. This entails sighting down the WCSPL to ensure aircraft do not cross it, either where it is actually painted on the deck or where it extends into space beyond the angled deck. As a

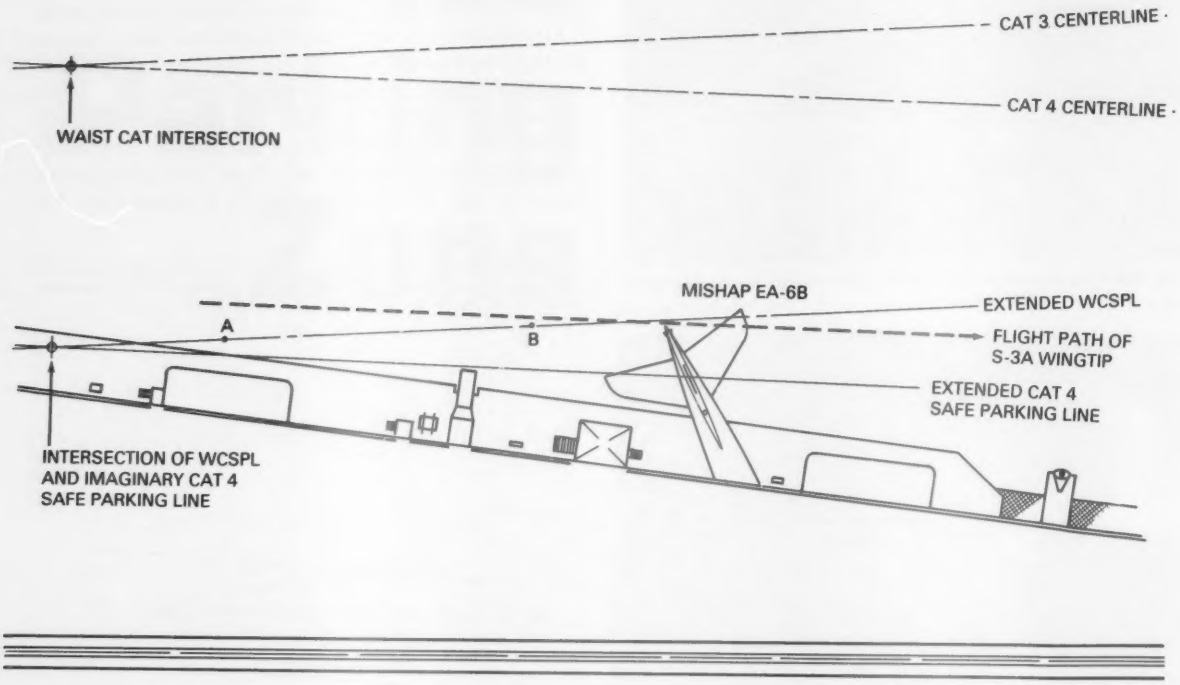



Fig. 2. Scale drawing of the mishap. "A" marks where the E-2 wing would cross the WCSPL and "B," that of the A-3.

*APPROACH* diagram by Frank L. Smith

result the term "shot line" has become interchangeable with waist catapult safe parking line and naturally the procedure is known as "checking the shot line." The rub is that in neither NAVAIRENGCEN-91131 nor CV NATOPS is there guidance that suggests such a use for the WCSPL. My feeling is that the WCSPL was developed to provide clearance only between waist cat launched aircraft and aircraft parked along the actual line. Since cat 4 is outboard of cat 3 a separate line would not be required to deconflict aircraft launched from it. Additionally, as stated before, the WCSPL provides about two feet of clearance between a cat 3 launched E-2 and the line. Any number of factors could diminish this clearance after the E-2 leaves the shuttle, e.g., aircraft drift, port crosswind, or ship in a turn. Two feet seems to be slicing the safety margin a bit thin. One last thing supports this reasoning. The WCSPL does not account for the converging flight path of cat 4 launched aircraft.

The day after the mishap, the ship changed its spotting procedures on the bow to prevent a recurrence of this mishap and issued an urgent change request to the NAVAIRENGCEN-91131. The ship's solution is to spot aircraft on the port bow forward of the intersection discussed, so no part extends beyond the port deck edge coaming. Aircraft aft of the intersection will not extend beyond the port catwalk. The Naval Air Engineering Center's response arrived the next day. Their solution was to prescribe a line parallel to cat 4 using the same criteria established for the WCSPL.

In light of the potential hazard this mishap exposed, we learned a very valuable lesson quite inexpensively. An article on how the flight deck markings are developed by the Naval Air Engineering Center would be well recieved.

Hopefully this one will provide the impetus.

# FOD-gram

FOD comes in many forms and can be very deceptive. See if you can find the hidden FOD in the anagram below. Words may be spelled up, down or diagonally, backwards or forwards.



| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | S | V | S | T | U | N | R | O | H | C | N | A |
| X | B | Y | R | O | D | A | O | N | A | R | E | S |
| E | A | M | E | P | R | T | C | O | I | N | S | T |
| R | T | C | F | K | S | R | K | F | O | D | G | T |
| C | L | I | P | S | R | Z | S | P | O | R | H | U |
| A | L | T | M | V | E | E | A | L | O | S | M | B |
| S | U | O | Q | U | H | V | T | S | P | W | R | T |
| E | P | O | I | J | S | K | X | T | N | E | V | E |
| S | E | L | R | O | A | I | T | U | O | R | A | R |
| G | N | S | I | D | W | O | I | N | A | C | L | A |
| A | S | K | P | C | E | Z | U | G | H | S | T | G |
| R | T | O | L | V | E | H | S | T | L | O | B | I |
| L | W | E | R | I | W | Y | T | E | F | A | S | C |

cotter keys
washers
screws
safety wire
splice
tools
anchor nuts
rocks
FOD
nuts
bolts
cigaret butts
pull tabs
coins
rags
pens
clips

By AE1 Logan, VAQ-135

Lt. Bill Miles
Lcdr. Steve Jones
VF-211

IT was the second engagement of a two-versus-unknown dissimilar air combat maneuvering (DACM) flight on the MCAS Yuma tactical aircrew combat training system (TACTS) range. Lt. Bill Miles and his RIO Lcdr. Steve Jones of VF-211 had successfully engaged their adversary at merge plot obtaining a TACTS-scored kill, when an additional bogey was sighted at seven o'clock, no threat. While dragging the bogey south with a high-speed extension maneuver, a loud thump was heard, followed immediately by an engine overtemp aural warning tone. Although Miles was looking over his left shoulder and neutralizing his adversary, he instinctively brought both engines to IDLE in accordance with F-14 NATOPS procedures. Immediately looking into the cockpit and focusing on his engine instruments, he determined that the right turbine inlet temperature was pegged at 1300°C. As he secured the right engine, the right fire-warning light illuminated. Miles instantly applied the appropriate boldface procedures and turned the aircraft northwest toward MCAS Yuma. This action took place within seconds. Calling a "knock-it-off," the bogey acknowledged smoke and flames coming out of the aircraft. As the flight leader joined for a visual inspection, the fire-warning light went out. There were no subsequent signs of fire or smoke. After declaring an emergency, Miles and Jones read and complied with the single-engine and complete flight hydraulic failure NATOPS procedures while en route to MCAS Yuma. Obtaining clearance for a straight-in landing on runway 3, the landing checks were performed, only to find that the flaps would not come down. Faced with a runway temperature of 99 degrees and a single-engine, no-flap approach, the crew decided to make a short field arrested landing. Due to the flight hydraulic failure, the tailhook was lowered using the emergency extension procedures. Since the arresting gear for runway 3 is 3,500 feet down the runway, a decision was made to fly a high ball into the field arresting gear reducing the wear on the hook point. Miles flew a flawless pass into the short-field arresting gear.

An engineering investigation revealed a catastrophic failure of the No. 3 bearing burned a two-inch by five-inch hole in the engine's external casing, scorching several nearby hydraulic lines. If Miles had not reacted as quickly and professionally as he did, the aircraft may have been lost. ◄

Lt. Bill Miles (pilot), Lcdr. Steve Jones (RIO)

# BRAVO ZULU

Cdr. Pearson
Cdr. Miller
VF-154

WHILE conducting a routine air intercept mission in an F-4N from USS *Coral Sea*, the pilot, Cdr. "Hoss" Pearson, executed a half deflection aileron roll to the right at 300 knots and 8,000 feet. At the completion of the maneuver, the control stick would not return past 10 to 15 degrees right of center. The pilot fed in full left rudder to stop the roll and notified his RIO, Cdr. "Gar" Miller, who immediately referred to his NATOPS pocket checklist for a possible solution. None was listed. The aircraft stabilized with 60 degrees right wing down. Level flight was achieved using full left rudder trim and 35 to 45 pounds of stick force. A wingman joined and confirmed that the right spoiler was up about 30 percent and the left aileron was full down. In an effort to free the stick, the pilot engaged the paddle switch, retarded the throttles and slowed down but it had no effect. The pilot then turned the yaw augmentation off which created a worse situation, so he quickly reengaged it. He proceeded to pull the trim control and aileron trim circuit breakers to no avail. Pearson continued to experiment with the controls to test maneuverability while the RIO obtained vectors and flight following to a bingo field 200 miles distant. As soon as full left rudder was neutralized at all, the aircraft would roll to the right. It sought a 25-30 degree right wing down attitude. The crew discussed the possibilities of a carrier landing but that idea was quickly discarded. They were directed to divert. They also discussed executing another roll to the right in an attempt to free the controls, but decided that if the situation became any worse, ejection would follow.

The aircraft responded more favorably at slower airspeeds so the flight to the initial approach fix took 40 minutes. The RIO briefed the controllers at the bingo field that they could only make right-hand turns and would be flying a straight-in approach to an arrested landing. A 15-mile straight-in was deemed sufficient. The pilot dirtied up with half flaps at 10,000 feet. The aircraft appeared more sensitive but still controllable. Low altitude ejection parameters were discussed as a precaution. Pearson flew a flawless approach at 190 knots until over the landing threshold, at which time he flared to 160 knots so as not to exceed arresting gear limits. An uneventful arrested landing was made. Subsequent investigation revealed that a bolt had lodged between the bottom of the control stick and the throw limiter.

The aircrew's professionalism and the pilot's immediate assessment and rapid action to counter the roll are especially noteworthy. Had not all options been thoroughly discussed and the required procedures taken, the loss of an aircraft would have been almost a certainty. Pearson and Miller are highly commended for their situational awareness and careful execution of innovative procedures. ◄

Cdr. Pearson (left),
Cdr. Miller (right).

# The HAC Didn't Hack It

*The SH-3H mishap helicopter had a history of fuel management gripes. Similar problems surfaced during the HAC's first flight on the day of the mishap. Nevertheless, the HAC elected to conduct a subsequent flight with a known fuel system "downing" gripe. This is an old sad song in naval aviation. Unnecessary risks are taken by usually well-intentioned flight or ground personnel to get the job done — and as long as no mishap occurs, the risk-takers are looked up to as "hackers." Fortunately most of the hackers make it without incident, but sometimes the odds catch up with one of them and he loses the gamble. What follows is a description of one such instance.*

**By Russ Forbush**
**Approach Writer**

BEFORE describing the mishap itself, we'll discuss the fuel management problems that plagued this particular SH-3H. About six weeks prior to the mishap, the H-3 was conducting a night ASW mission from its homebased CV when it was noted by the aircrew that the forward fuel tank was burning down rapidly while the aft fuel tank was indicating high. Crossfeed procedures were initiated in accordance with NATOPS, but the indicated abnormal fuel distribution worsened. Finally, the aircrew decided to declare an emergency, bustered to the CV and landed onboard with 300 pounds of fuel in the forward tank. The forward low fuel warning light had illuminated during the final portion of the approach. Maintenance action taken to correct this discrepancy consisted of tightening the ejector lines and a fuel check valve in the fuel transfer system which was found to be loose. The helo subsequently flew two sorties for about two hours with no documented fuel transfer/quantity problems.

During a flight 11 days later, a similar malfunction occurred. Again the fuel appeared to be burning down rapidly in the forward tank while remaining at a high level in the aft tank. The aircrew initiated crossfeed procedures in an attempt to alleviate the problem, but the H-3 landed with 600 pounds of fuel indicated in the forward tank and 2,200 pounds indicated in the aft tank. Two days later,the aircraft experienced the same fuel transfer/quantity problem prior to landing ashore. (Note that the mishap HAC was also the HAC during the first and third flights described above.) Maintenance action included replacing and calibrating the aft fuel tank indicator, (the aft fuel quantity indicating system was not calibrated in accordance with NAVAIR 01-230 HLH-2-2.1).

Five days before the mishap flight, the aircraft was downed because the aft tank fuel quantity read zero. Maintenance personnel switched fuel gauges (forward and aft fuel tank gauges are the same in the SH-3) for troubleshooting. This resulted in the replacement of one of the fuel probes in the aft fuel tank. However, the TF-20-1 test set was not used to troubleshoot the problem. Instead, the aft fuel tank probe was replaced using work package 2302 which requires no calibrating action. The aircraft then flew seven sorties and 17 hours prior to the mishap with no documented fuel transfer/quantity problems. Now that we've established the fuel management problems associated with the mishap aircraft, let's address the mishap itself.

The SH-3 and crew were scheduled for a CV plane guard mission which would include a helicopter inflight refueling (HIFR) overhead the fantail of a frigate. A thorough NATOPS brief and aircraft preflight inspection were conducted with no discrepancies noted during the preflight. The aircrew then manned the aircraft, performed all NATOPS checks and started the engines. Rotors were engaged at 1701 and the helo lifted off the CV deck at 1711. Indicated fuel tank readings at takeoff were: forward 1,700 pounds, center 700 pounds, aft 1,900 pounds.

About 1800, both pilots noticed that there was differential fuel usage among the three tanks. Readings were: forward tank 1,100 pounds, center tank 600 pounds, aft tank 2,000 pounds. (Note is made that during normal operations, the forward tank supplies fuel to the No. 1 engine and the aft tank supplies fuel to the No. 2 engine.) With the given fuel distribution in the SH-3 aircraft, the aft fuel tank quantity indicator normally decreases first as fuel in the center tank transfers forward via a common opening and a fuel injector line. Center tank fuel does not transfer aft until the fuel level in the aft tank reaches 600 to 900 pounds. At that level the aft tank float valve opens, permitting transfer. Thus, the indication of normal fuel transfer for the initial portion of the mishap flight should have been a discernible decrease in the aft tank, a smaller decrease in the center tank and little if any decrease in the forward tank. At 1800, the crossfeed switch was cycled to ensure it was closed; the crossfeed circuit breaker was pulled; the forward boost pump switches were secured, and the forward boost pump circuit breakers were pulled. Differential torque was applied with the No. 2 engine producing 20 percent more torque than the No. 1 engine. This was done to increase fuel burndown in the aft tank. The HAC vetoed crossfeed procedures because they had not appeared effective during his two prior flights in this aircraft involving fuel management problems. During the next 15 minutes, the HAC noted a 300-pound drop in the aft tank fuel quantity indicator and assumed his nonstandard troubleshooting procedures were working.



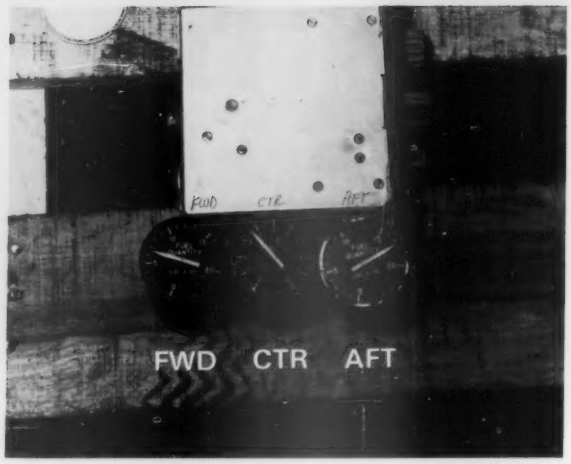
Shortly thereafter, the H-3 was ordered back to the CV to pick up a passenger for transfer to an accompanying frigate. Prior to landing at 1811, the HAC reconfigured the aircraft fuel system as follows: forward tank — one fuel boost pump on, aft tank — one fuel boost pump on, all fuel boost pump circuit breakers and the crossfeed circuit breaker were reset. Upon landing at 1811, fuel tank quantities indicated, forward — 1,100 pounds, center — 600 pounds, aft — 1,700 pounds. It would normally have been expected that the HAC would down this aircraft following landing since he had done so on the previous two occasions when similar fuel management problems were experienced. In this instance, however, he decided to wait until the mission was completed before downing the helo. He based his decision on the following factors:

He didn't consider the H-3 to be in extremis and was capable of continuing with the mission in proximity to the CV.

He wanted to further investigate the apparent fuel system malfunction in flight in order to facilitate corrective action by maintenance personnel.

Continued

Center tank aft cell fuel probe inner core lies at left while the center tank aft cell fuel probe (parts) is at right.




Fuel quantity readings on gauges following aircraft salvage.

He had sufficient fuel onboard and perceived his nonstandard fuel management configuration would draw fuel from the aft tank and provide the necessary fuel to complete the mission.

The essential nature of the plane guard mission reinforced his desire to continue flight.

At 1818, the HAC lifted the H-3 from the CV and headed for the frigate. En route, it was discovered that the aft tank fuel quantity indicator was reading 2,000 pounds, which was 100 pounds more than it read when the aircraft took off at 1711. The HAC then reemployed the nonstandard troubleshooting technique he had used earlier. He felt the aft tank would again begin to show a fuel drop. After about 10 minutes of flight, with no noticeable fuel usage from the aft tank, the remaining aft boost pump was turned on with the following fuel distribution: forward tank — 700 pounds, center tank — 500 pounds, aft tank — 1,600 pounds. This indicated a usage of 600 pounds in 19 minutes, a consumption rate of 1,800 pounds per hour which is abnormally high. The HAC told the copilot that nonstandard troubleshooting procedures were being used but not the rationale behind them. The copilot later stated that he didn't know what the HAC was doing but felt the HAC knew a lot more about the aircraft than he did. At no time did the copilot question the use of these procedures. The fact that the HAC was also the CO probably played a role in his reluctance to challenge these procedures.

After a delay in establishing communications with the frigate, the frigate flight deck was readied and the H-3 approached the ship. Fuel tank indications were; forward — 450 pounds, center — 500 pounds, aft — 1,700 pounds. The weather was ideal for a passenger drop and expected HIFR. At 1850, the passenger transfer and fuel sample hoists were completed. Two minutes later, while over the flight deck preparing for HIFR, the No. 1 engine quit with no secondary indications. The HAC then executed a controlled single-engine water landing. The superb airmanship of the aircrew was instrumental in eliminating injury to the flightdeck and aircraft crews and minimizing damage to the aircraft. An attempted restart of the No. 1 engine to dump fuel and increase buoyancy failed and the HAC gave the order to abandon the aircraft. The crew was rescued by a frigate motor whaleboat and the H-3 subsequently salvaged.

A postmaintenance inspection revealed that the following conditions existed at the time of the mishap:

Neither forward tank boost pump was operating.

The center tank aft fuel probe was broken and lying on the bottom of the tank. It indicated there was 500 to 600 pounds of fuel in the tank. The analysis of this fuel quantity indication supports the assertion that the center tank was empty at the time of the mishap.

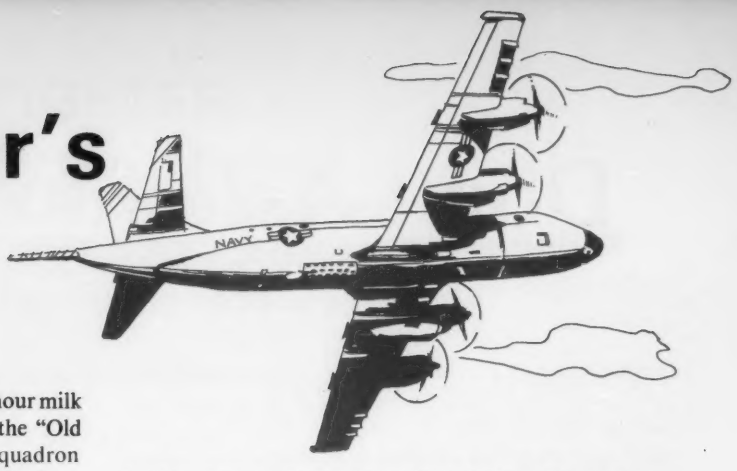
A malfunctioning transfer check valve in the center tank allowed air to enter the fuel system.

Based on the above conditions, it became inevitable that the No. 1 engine would fail due to fuel starvation. Air introduced into the fuel line from the empty center tank caused the engine to flame out.

However, it wasn't the fuel system malfunctions or a lack of effective squadron maintenance procedures that caused this mishap. It was the "let's push on" attitude of the HAC in pursuing the completion of this mission. Had the HAC downed the aircraft as he should have done following the 1811 landing on the CV, this mishap would not have occurred. He implemented nonstandard fuel distribution procedures which he really thought would work, rather than establishing a fuel management configuration in accordance with NATOPS.

No one can fault an aircraft commander for wanting to complete a mission he considers essential. But trying to do it with an aircraft that he knows has a malfunctioning fuel system is courting disaster. While downing the H-3 after the 1811 landing would have caused some inconvenience to CV flight deck personnel and required another helo for plane guard duty, that's the action that should have been taken.

# The Skipper's On Board




By AXCS Gordon Flinn
VP-4

A PIECE of cake, that's what it will be. A three-hour milk run up to the Commodore's headquarters with the "Old Man" aboard. A good chance to show the new squadron commanding officer what a "red hot" crew he has. But how does that old saying go? The best laid plans of mice and men . . .

The flight is scheduled to drop off the CO and the rest of the squadron "heavies" including the maintenance officer. Then we continue on to deliver maintenance personnel and parts to another site where one of the squadron aircraft is undergoing major structural repair. A quick return to pick up the CO and the heavies, and we are on our way back to home plate. It makes for a slightly longish crew day but well within NATOPS limits, and it is a good chance to get in some landings and nav time.

Preflight is at 0300 and proceeds without a hitch. Since the passengers include maintenance types, it is especially complete so everyone knows what to do in the event of emergency. All in all, it's a polished performance that has the CO smiling.

Then the first glitch: at the end of the runway an engine anti-ice light will not go out after test.

"Damn, and with the skipper on board too." What to do? All indications are it's a faulty switch. It's no real problem. The system must be working OK. Why delay the flight? We don't want the skipper to be late for his first meeting with the commodore.

Nope! We head back to the line to take a look. The maintenance personnel agree with the switch theory and install new ones. Now the light won't come on at all! Is it a bad switch from supply? Two new ones are tried and the problem is solved. Great! Let's go!

We are now two hours late but on the way. Three hours later we land at the first stop. The car to pick up the skipper doesn't show. Well, we *are* late. A quick call gets transportation on its way. The aircraft taxis out and takes off. Once again, all's right with the world.

Glitch number two: twenty minutes out, we get a chip light on No. 2 engine. We turn back to the field and shoot an uneventful three-engine landing. Sure glad the skipper wasn't on board for this one!

The real problem here is that this is not a major P-3 support base. However, another type squadron with similar aircraft maintains a small maintenance detachment here so our crew goes to work. Working on a ladder (no B-4 stand available), we check the mag plugs. A minute sliver seems to be the culprit on the gearbox plug. It looks as if a penalty run will check out good. Sighs of relief. Would sure hate to strand the skipper here.

Oil is rounded up and the necessary filters are cleaned and replaced. But all of this has taken time, and it's starting to get dark. Pumping oil through a servicing unit sure is time-consuming. Why don't we just church key the cans and pour it in? The cans are clean and after all, that's why we have filters don't we?

Nope! It may take longer to pump the oil through the servicing unit but that's the way the maintenance instruction manual says to do it.

It's dark now. The skipper is back and ready to go. The penalty run is successful so we are ready.

Glitch number three: that #$@% engine anti-ice light again. They must not have adjusted the switch correctly. Well, we know the system works OK. And it can't be anything serious. It's only three hours back to a *real* maintenance department. So what if the "crew day" will run out. We only need one additional hour. Let's go!

Nope! The crew is tired, the decision is made. Amid moans and groans, we stay the night.

The next day, rested, with a full day ahead and no need to hurry home, a "just in case" leak check is made on No 2 engine. A major bleed air leak! If we had succumbed to the pressure the night before, what might have been the result? An inflight fire warning perhaps, with a crew at the end of their mental rope. Not the ideal combination for success. But because this crew knew when to call it a day, because they wouldn't give in to the temptation to show off their "can do" spirit to the "old man," they didn't allow themselves to get behind the power curve. And you can bet the skipper knows it!

We talk about it all the time. But this nonincident once more points up the critical issue. There is no evolution so important that safety is secondary. Even in time of war, the aircraft that crashes on its way to the target, doesn't contribute to the mission. All it does is waste lives and resources.

This crew knew when to stop, even in the face of pressure to continue, even though "the skipper" was on board. How do *your* crews react in similar situations? There should only be one answer. ◄

# Don't Ask

By Lt. R.C. Thompson
VA-27

HAVE you ever stopped to think about the different facets of our profession that are taken for granted? Oh, everyone knows about that. I'd like to relate a little story that hopefully will get everyone to bone up on those things that we, as naval aviators, already know.

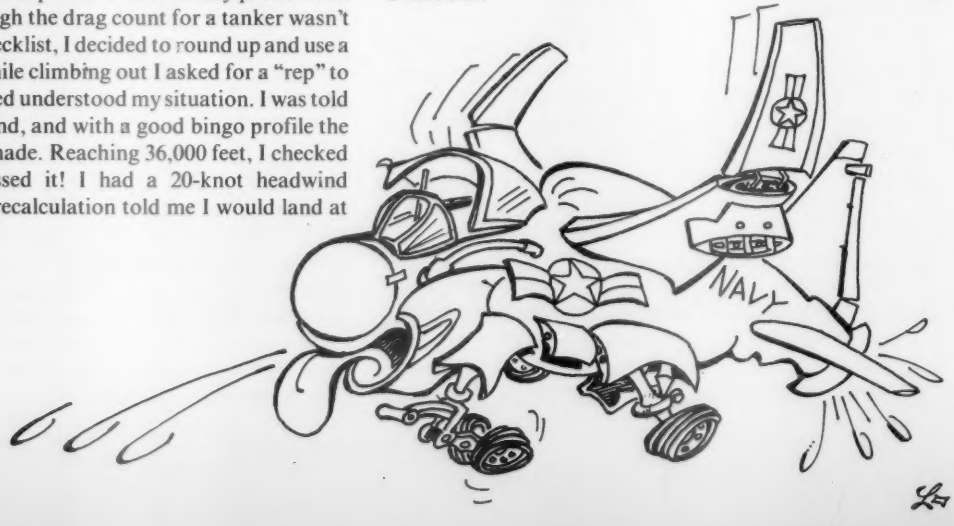
The ship was on its ORE and last at-sea period prior to cruise. Weather the entire time was less than desirable, and the ship's ramp movement occasionally exceeded 20 feet. Pitching deck landings were becoming commonplace. I was launched in a KA-7 as an on-station tanker for an AAWEX about one hour prior to sunset. The ship was about 420 miles from NAS Miramar, so naturally we were using "blue water" fuel minimums. The tanking went without incident. When I checked in with Marshal, I was told to buster because we had a ready deck. Once established in Marshal we started getting the old familiar "99 max conserve, Delta four" calls. After three Delta calls, I started getting a little concerned. My state was now 3.7. Shortly after that, the aircraft above me started getting bingo calls 020/420 miles. No one ever told us the reason for the bingo. Consequently, there was no reason to believe the deck might not be cleared soon.

Later, we found out an A-7 had broken a mainmount on landing and couldn't be moved from the landing area. With a fuel state of 3.5, I called Marshal and told them they had better bingo me now if that was their intention. I got the familiar reply of "stand by." Meanwhile, two aircraft below me were bingoed. That left only the E-2 and myself. I called again asking for fuel, "just in case" and was told there was none available! It was then that I got the call to bingo.

The required fuel to bingo 400 miles and land with 800 pounds reserve was 3,450 pounds. I started my profile with 2,900 pounds. Although the drag count for a tanker wasn't listed in the pocket checklist, I decided to round up and use a drag count of 100. While climbing out I asked for a "rep" to make sure all concerned understood my situation. I was told I should have a tailwind, and with a good bingo profile the divert field could be made. Reaching 36,000 feet, I checked my winds. You guessed it! I had a 20-knot headwind component. A quick recalculation told me I would land at my bingo field with about 350 pounds. Already at altitude, it was at this point that I decided to keep my droptanks. Pressing on toward the beach, I started squawking emergency, made contact with the offshore controlling agency and was told a KC-130 tanker was airborne. I was given a vector, but refused it. I told the controller I would attempt tanking only if the KC-130 could join on me. I was told to proceed.

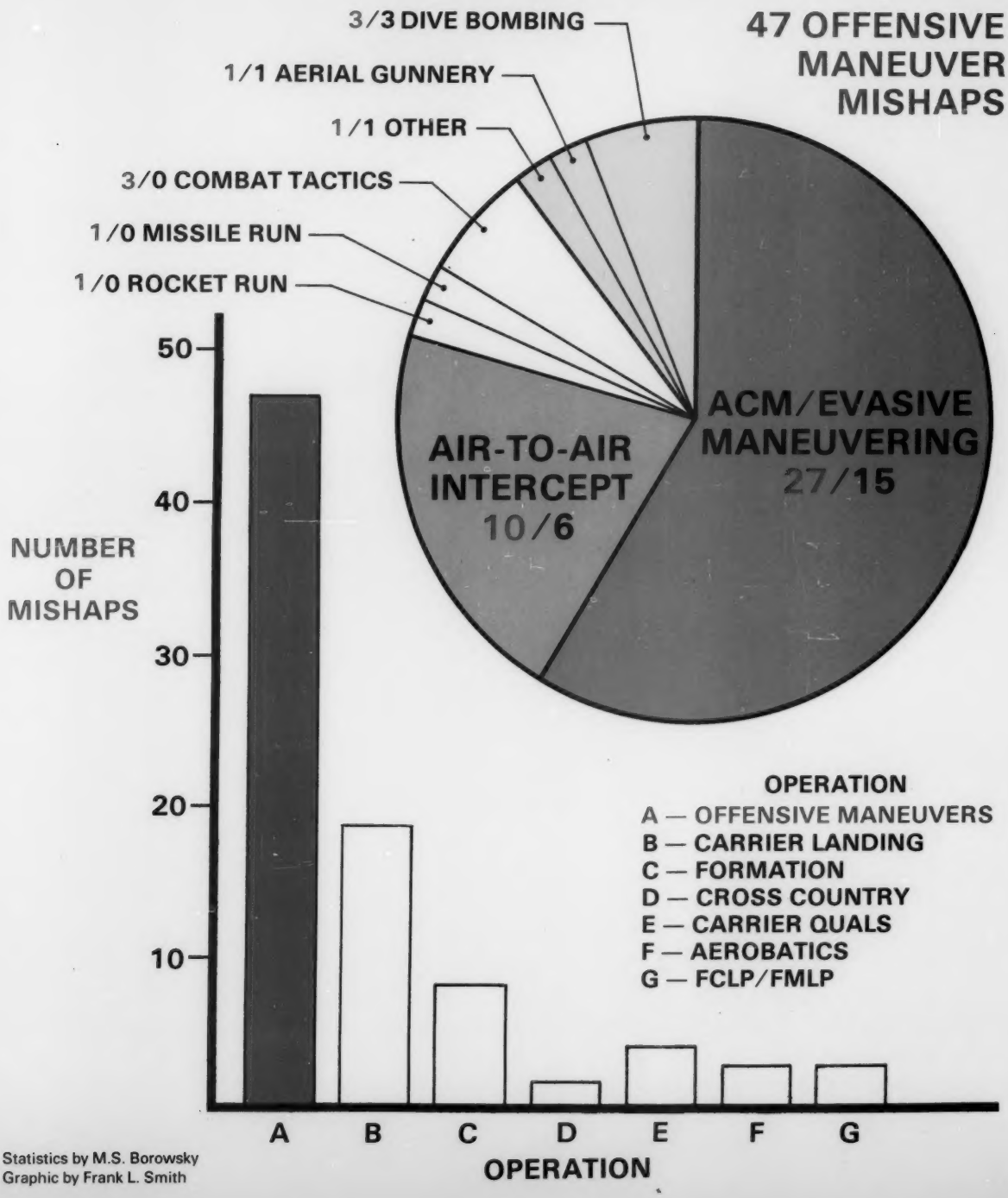
Prior to switching up approach control, I requested the controller pass that I was declaring an emergency for fuel. Switching to approach control, the radios were clobbered with at least eight aircraft trying to land at the primary divert. All had declared an emergency or were minimum fuel. With another divert about 30 miles closer, I decided to land there. Checking in with approach, I declared an emergency and was told to stand by because "there were multiple emergencies in progress." I waited and finally just butted in, telling approach I was emergency fuel, I had about 10 minutes of gas left and was starting a descent for North Island. It was black outside, but the cockpit was well-lit by the low fuel light, as it had been for 20 minutes! I was finally handed off to divert radar. Evidently, they didn't have the picture, because I was told to level off and do a 360 for traffic. Once again I explained the situation. Only then was I cleared for a straight-in approach. Tower reported the runway as wet and braking action as fair. I elected not to take a trap and foul the runway, just in case there was someone behind me in the same predicament. The landing was uneventful except for the fact that I had *less than 300 pounds* of fuel left!

The lessons learned? They seem obvious once you're safely on the ground, but what about before flying a "routine mission"? Do you know how to fly a *real* bingo profile? If mach number and max range angle-of-attack don't match, which do you fly? Have you done approaches, or at least looked them over, for fields designated as bingos? Most importantly, do you realize that you are the one that signed for the aircraft? When it comes to getting it safely on deck, sometimes you have to tell people what you are going to do! Don't ask. ◄



# FIGHTER

## ALL NAVY and MARINE
## HIGH RISK FLIGHT REGIMES
## CLASS A MISHAPS/PILOT CAUSAL FACTOR
### CALENDAR YEARS 1977 — 82




Statistics by M.S. Borowsky
Graphic by Frank L. Smith

If you

# NEVER

walk through a prop arc, you'll

# NEVER

be hit by a prop.

Naval Safety Center
NAS Norfolk, Virginia

Poster idea contributed by VA-95 Safety.